

POPULAR SCIENCE

OCTOBER 1956 *Monthly*



Your first look at the

1957
FORD

Page 100

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66%

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OCTOBER 1956

Popular Science Monthly

October, 1956



Takes to water like a Duck—but better! It's the Army's new Drake, a rip-snorting amphibian that can hit 45 m.p.h. on land or give a loaded six-by-six a piggyback sea voyage.



This electric "two-master" on wheels is a lifesaver for miners: no carbon monoxide.

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The hi-fi bandwagon's rolling! Here's a chance to get aboard.

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Nothing like a good roof over your head. Step-by-step pix show how.



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PS Readers

TALK BACK

Applause from the Navy

It was gratifying to see your excellent story on guided-missile cruisers in your July issue [p. 120]. Needless to say, we were



more than pleased with the cover.

HERBERT E. HETU, LTJG, USN
Department of the Navy, Washington, D.C.

Gus Wilson Sticks to His Story

In "Gus Seizes at a Straw" [Aug., p. 144], Gus Wilson says, "The gas pump takes a longer diaphragm stroke . . ." Maybe the owner of the rabbit-loaded pickup believed this, but I didn't.

W. A. THOMAS JR., Morristown, N. J.

It's true though. Linkage pulls the diaphragm down against a spring, which then pushes it up to pump gas. If the carburetor float valve is closed, the spring cannot force gas out and the diaphragm stays down. On light loads, it may barely flutter.

Why the Tube Doesn't Blow

THE last episode in your fine article, "Why Tubes Play Dead in TV Circuits" [July, p. 183], has me stumped. This involved a series string with the first two tubes lit and the others out. Your explanation was that a filament-to-cathode short in the second tube, a 5J6, siphoned off the 117-volt juice before it could reach the other tubes. Now why didn't the first two tubes blow out? With 58.5 volts across a five-volt filament, something has got to go.

JOHN A. BREHM, Elizabeth, N. J.

We bounced that one to author Margolis, who writes:

Series filament strings include other com-

ponents to prevent such overloading. In this circuit, a 45-ohm resistor ahead of the tubes provided a 90-volt drop. There was about 10 volts across the first tube (a 3BC5), leaving about 16 volts across the shorted 5J6. While the 16 volts didn't do the 5J6 filaments any good, they were still able to light.

ART MARCOLIS, Levittown, Pa.

How Stock Is a Stock Car?

Why all the harping about the stock nature of the Chrysler 300B and the Dodge 500, class winners in the last Nascar races [Apr., p. 128]? Any car that has 50 horsepower more than the ordinary model is hardly stock. A Chrysler 300B with 340 horsepower or a Dodge 500 with 260 horsepower is in a class by itself.

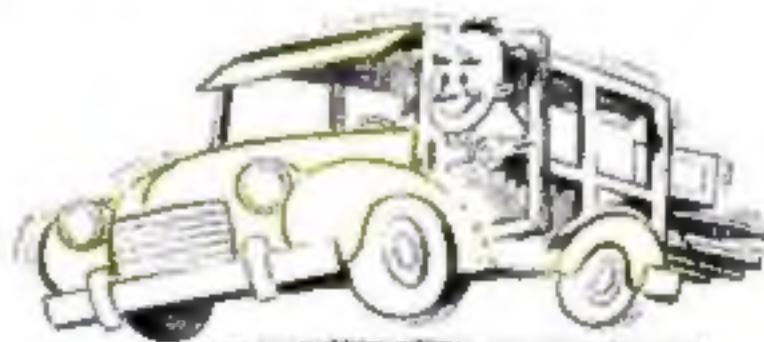
AMALIO C. GARCIA, Iloilo City, Philippines

As POPULAR SCIENCE said in its report on the 1956 Nascar races: "The speeds achieved . . . bore only a remote relationship to what a man might expect from a 1956 car purchased at random."

Is the Station Wagon Extinct?

As I drive my aging "wagon," I feel a sort of remorse as I realize that soon the last remaining members of this breed will be extinct like the dodo bird.

Years ago the wagon was a fragile thing . . . peeling varnish, rotting wood and



rattling doors. Someone with a knowledge of genetics began inbreeding cars and came up with a hybrid that had all the good points desired . . . tough hide, tight doors, lasting paint, adequate seating, and above all, room — room in all dimensions. For a few years this hybrid hauled the family, the groceries,



When the other kids ask...

WHAT DOES YOUR DAD DO?

How does your boy answer them?

Sure...you're his hero. You know that. But sometimes it can get kinda tough if the other kids don't seem to understand about the "old man."

It's not that you like to be chained to the same old job. Maybe you just had to leave school too soon. Maybe the war inter-

fered. Anyway, here you are, stuck because you just don't have enough formal training.

Well, Mister, You Can Still Make the Grade!

It isn't easy. You've got to have grit and determination and the will to succeed. As long as you have

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B. NEW! Long 6-Point Box & Open End Wrenches. Provide greater gripping area for heavier torque loads. $\frac{1}{8}$ " to $\frac{1}{2}$ " openings, $5\frac{1}{4}$ " to $9\frac{1}{4}$ " lengths. Satin chrome plated.

C. NEW! Ratcheting 12-point Box Wrench. For oil filter work on new cars. $\frac{1}{8}$ " x $\frac{1}{2}$ " openings. $8\frac{1}{4}$ " long. PROTO line now includes 6 tools in this series.

D. NEW! Double Head 12-Point 15° Box Wrench. Meets Mil. Spec. Designed for use on elastic stop nuts. Openings, $\frac{1}{8}$ " x $\frac{1}{2}$ ". Length, $5\frac{1}{4}$ ". Satin chrome plated.



the camping equipment, and now and then furniture, lumber and concrete blocks. Like all hybrids, however, it was impossible to keep the breed true, and two years ago the wagon reverted to one of its parents, the sedan. It didn't take the exact form of its parent, but ended up with the luggage compartment inside with the seats. No headroom, fancy interior, real pretty but with little utilitarian value.

DR. ROBERT L. RICE, Richmond, Ky.

Missing: Two Condensers

THAT "Midget Transistor Superhet" [Aug., p. 197] is a honey of a little radio, but I had to make an extra trip to the parts store before I could get it to play. I trusted your parts list—but you left out C9 and C10, both 1-mfd., 12-volt, electrolytic condensers. It won't work very well without them.

KEN THOMAS, New York City

These two condensers were correctly shown in the pictorial wiring diagram (p. 198) and the schematic (p. 200), but were unfortunately omitted from the parts list. They are now included in the kit available from Lafayette Radio, New York, but if you buy parts locally be sure to add them to your shopping list.

Extra: One Wire

IT looks like there is one wire too many in your pictorial diagram of the transistor



radio. It connects the emitter of V2 and the base of V1, grounding the base of V1. But the schematic has the base of V1 not grounded. Should I put that wire in or not?

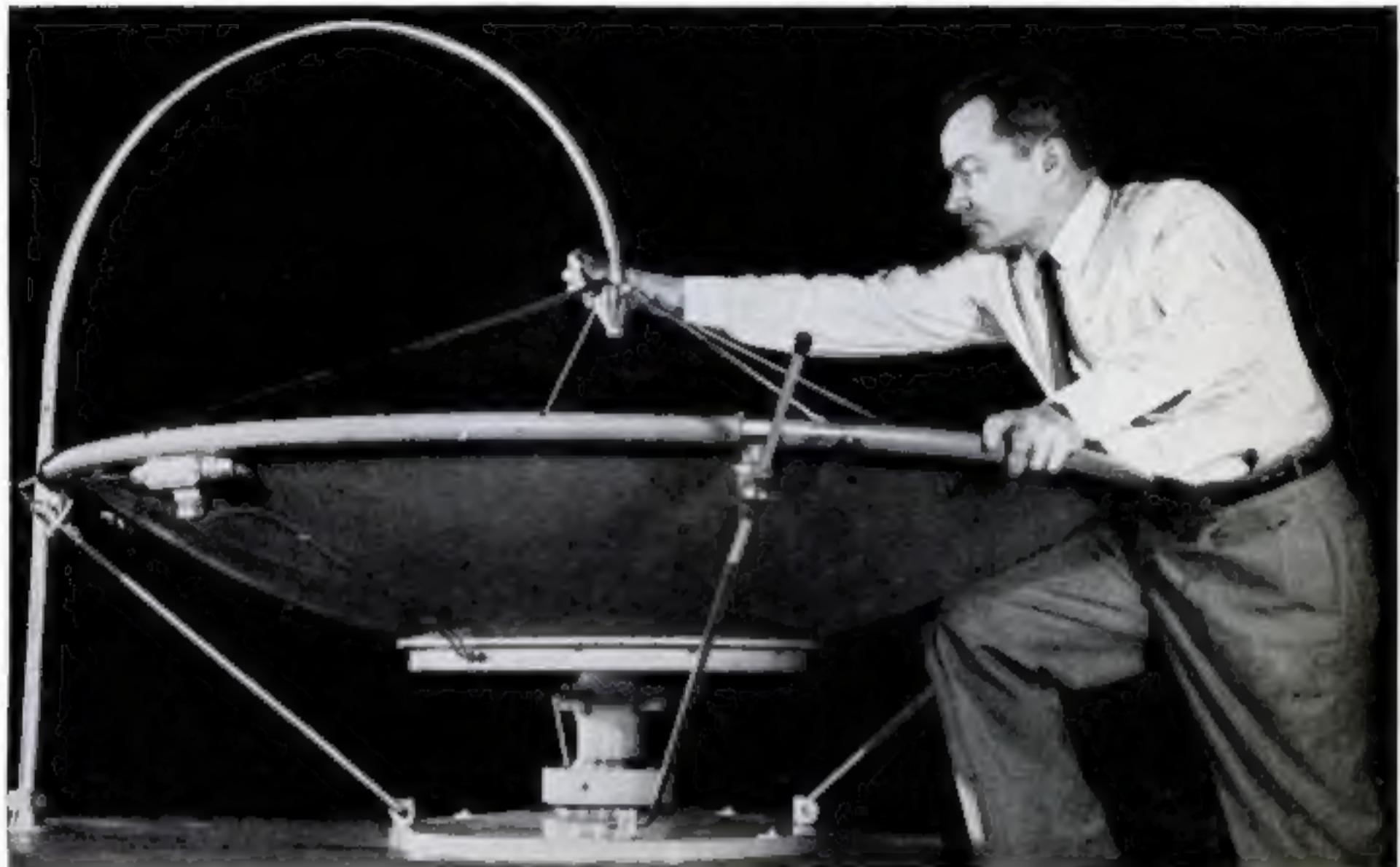
MICHAEL R. DOLITON, Rochester, N. Y.

The schematic is correct; the base of V1 should not be grounded. Somehow an extra wire crept into the pictorial diagram.

Measuring Wheel Measured Wheels

IN your story "His Shop Is a Museum" [July, p. 139], you described an antique measuring wheel as meant to do a job that

TEACHING A GIANT TO TAKE SHORT STEPS



Bell Laboratories' Dr. J. W. Fitzwilliam adjusts a wave-guide feed to a parabolic dish reflector. Dr. Fitzwilliam, who has a Ph.D. in physics from Massachusetts Institute

of Technology, leads the practical development of Bell's new 11,000-mc. system. Components had to be developed to operate in a frequency band not previously utilized.

The giant microwave highway that carries your TV programs along with telephone conversations from coast to coast has a versatile new partner—an entirely new microwave system which was created, and is now being developed, at Bell Laboratories. The new system operates at 11,000 megacycles—a much higher frequency than ever before used in telephone service.

Bell's present microwave systems—operating at 4000 megacycles—were designed for heavy traffic and long distances. The new system is designed especially for lighter traffic and shorter distances—up to 200 miles. Its traffic capacity is extremely flexible. Depending on traffic needs, the system can provide only one one-way or as many as three two-way broadband channels. Each two-way channel can carry 200 telephone conversations simultaneously or one television program in color or black and white in each direction along a route. The new system, which is already being operated experimentally, will be particularly valuable in providing additional telephone service and TV programs for cities in remote areas.

This is another example of how research and development work at Bell Laboratories help the Bell Telephone System to serve you better.



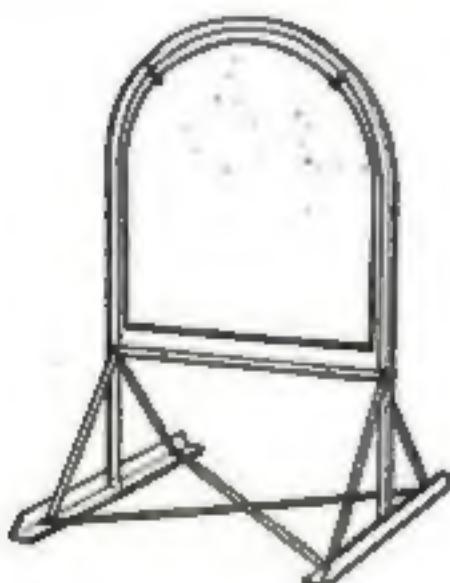
Mr. L. C. Tillotson, who originated the new system, adjusts the klystron-isolator combination which made the system feasible. Mr. Tillotson, an M.S. from the University of Missouri, heads research in microwave applications.



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steel tapes do today. I'm afraid it would be difficult to use a steel tape for the main purpose that those wheels were made for. They were used to fit steel tires to wagon wheels.

First the outside of the felloe was measured, then the inside of the tire. The tire, which was to be shrunk on, had to fit exactly. If too loose, it would not stay. If too tight, it would dish the wheel and weaken it.

The old measuring wheels came in several sizes, but always in even feet—no odd inches, and were very accurate. I haven't used one since I gave up blacksmithing over 40 years ago, and I doubt if I have seen one since.

E. H. BARNHOUSE, South Tacoma, Wash.

Old Shipwrights' Tools Not So Old

I READ your article on the construction of the *Mayflower II* [Aug., p. 138] with deep interest. But I take exception to your statement that buttock and water lines were unknown in the 17th Century.

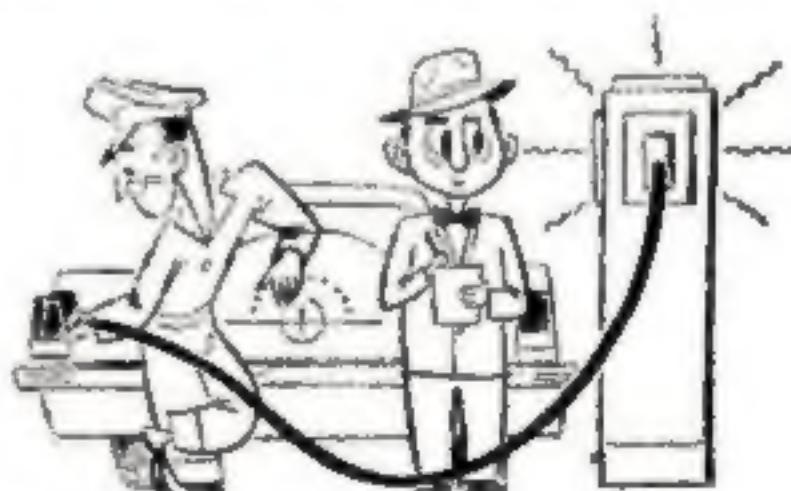
In the 14th Century Sir Mathew Spert laid down the plan of *The Great Harry*, the largest ship ever built at that time. The plan shows sheer plan, sheer lines and buttocks.

When I started serving my time 25 years ago in wood and steel craft, 17th Century tools were in wide use. I still have my calking tools in regular use, as well as adzes.

C. J. BRIDGMAN, East York, Toronto, Ont.
Member, The Worshipful Company of
Shipwrights of London.

Hills and Curves Eat Up the Gas

THE gasoline mileage (14) that Henry Comstock obtained on his trip from Chicago to New York in a Continental [Aug., p. 100] surprised me. My wife and I took a trip to



Montreal in our Mark II and averaged only about 12.5 miles per gallon.

JAMES ZORCH, Hamden, Conn.

The difference is understandable. The route to Montreal is much more hilly and curvy than the Chicago-New York turnpikes.



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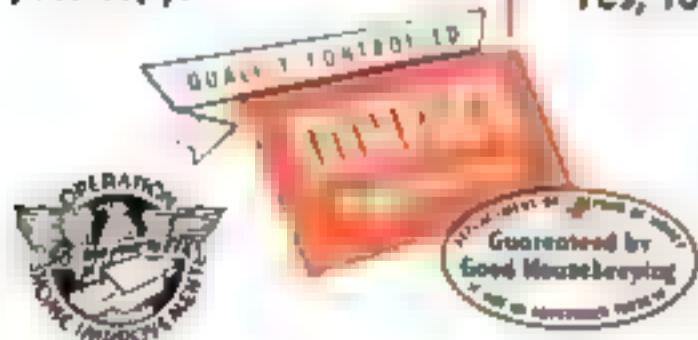
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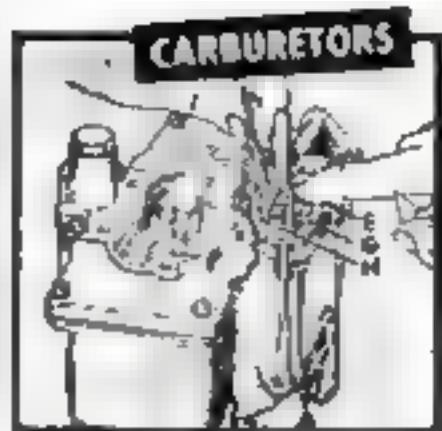
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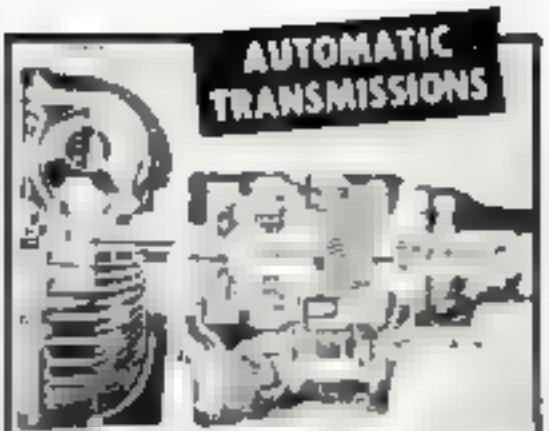
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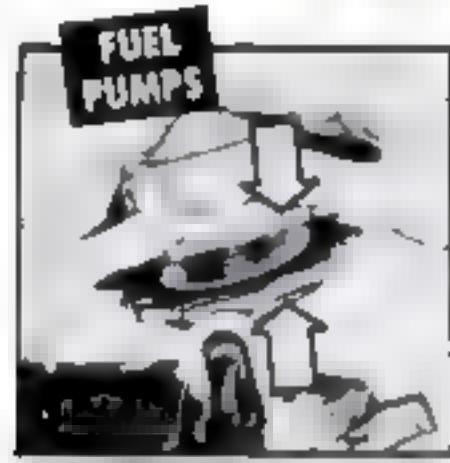


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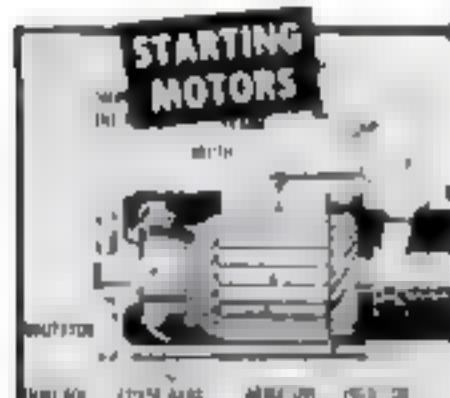
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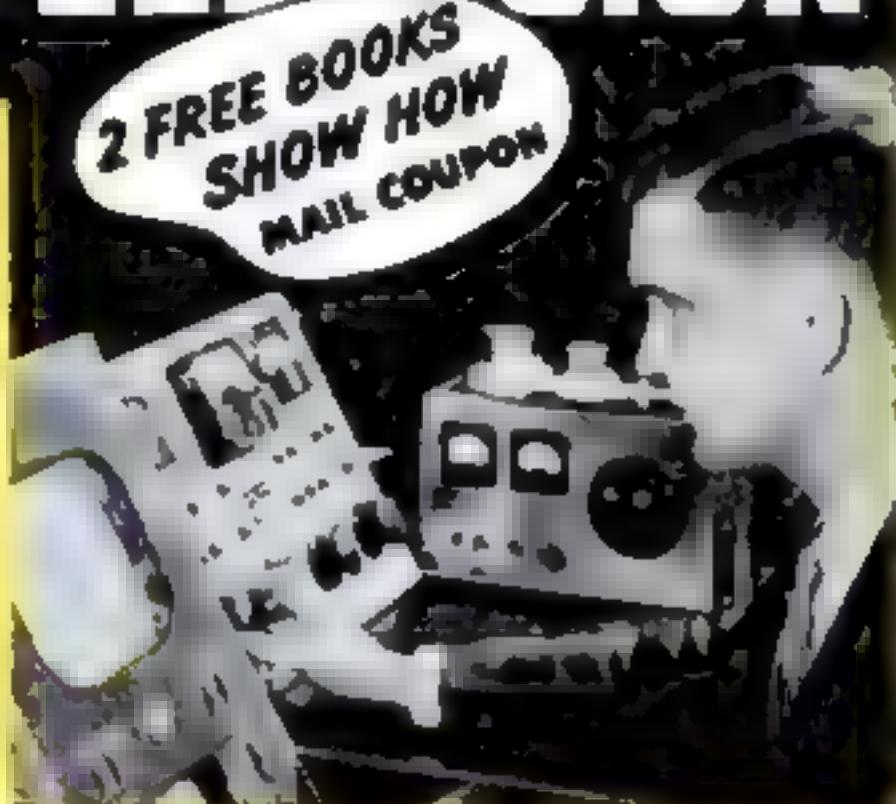
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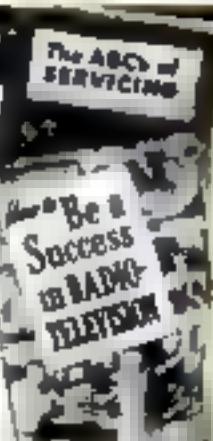
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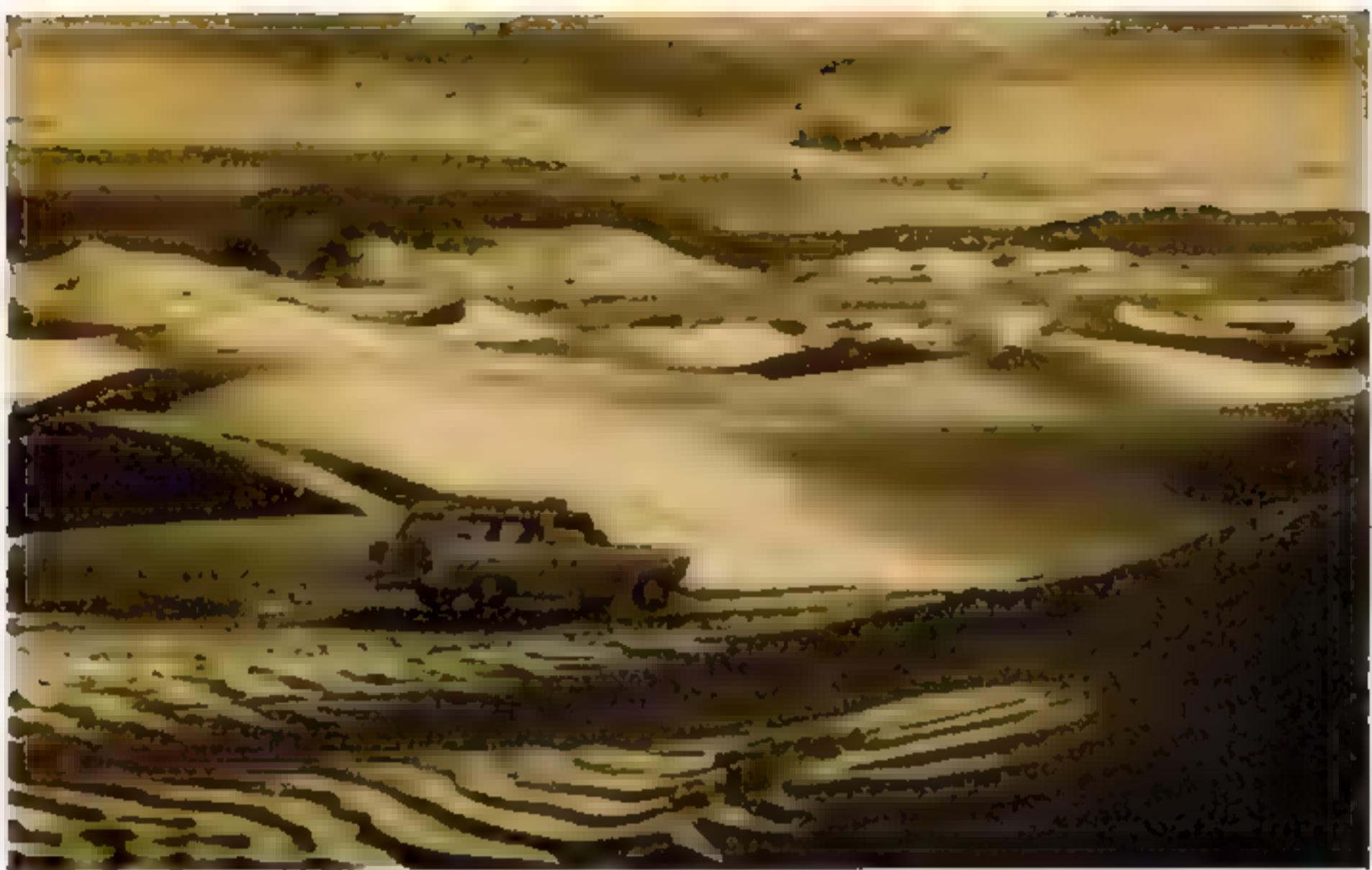
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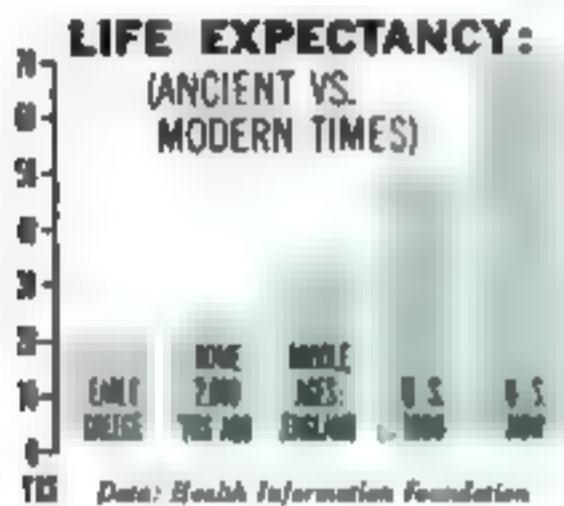
Needs water only 3 times a year*

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Auto-Lite manufactures over 400 products, including Spark Plugs, Batteries, Wires and Cables and Automatic Electrical Systems . . . sold throughout the United States and Canada.

Taking the death out of old refrigerators is one crusade that's finished. It ended in victory when Congress ordered, just before going home, that new refrigerators must have doors that can be opened both outside and inside by late 1958. Jumping the gun, General Electric already is abolishing latches entirely. Instead, permanent bar magnets, which have been used on some GE refrigerators, will now be standard on all models. You'd think this solution for converting doors into escape hatches is so simple that anybody could have dreamed it up. True. But this is the rub: Magnets don't hold doors so firmly as latches; you need a special gasket to keep the cold air in and the warm air out. GE thinks it has such, is offering to license its package to competitors. Most of them have been working on two-way mechanical devices since the rising toll of kids who suffocated in abandoned boxes. There have been 115 such deaths in the past 10 years.

Life expectancy in the U. S. and Western Europe now tops anything in the history of the world. As the chart shows, today's kids will reach



70, on the average. Credit medical science for much of that. Diseases of infancy have been subdued, while diseases of old age (cancer, heart trouble) are being checked gradually. Now think for a moment what medicine, coupled with general prosperity, is doing for this nation in the long run: They are adding upwards of 2,500,000 to the population annually (we're just about at the 170,000,000 mark). Little

wonder that economists see nothing but relatively good times ahead. Life expectancy in many parts of Asia and Africa still is only about half what ours is.

Watch your face in auto accidents. Injuries where they show most occur in about half the mishaps, says Dr. Jacob Kulowski after a study at the Missouri Methodist Hospital. This fact hasn't been talked about much before, he feels, because face injuries are usually grouped with head injuries in general. Like other researchers, Dr. Kulowski claims that the front seat (regardless of which side) is more dangerous than the back seat because windshield, knobs, or steering wheel could mar you.

Our uranium ore production is now 3,000,000 tons a year, says the Atomic Energy Commission, 40 times what it was in 1948. Uranium looks like a repeater on the history of oil—the more you use, the more you find. Potential reserves are estimated at 30,000,000 tons, with another 30,000,000 "inferred." On top of that, there are "large

Late News

areas of this country geologically favorable to uranium deposits that are yet to be explored."

Man's hidden powers—if any—remain a mystery. Can humans really perceive or influence events in special, unknown ways? A new scholarly book entitled "Extra-Sensory Perception" (Little, Brown & Co., \$6) tackles the question from various expert angles, but leaves it dangling. Experiments with cards, for instance, indicate that some people can beat the law of probability in naming what's on the unseen pasteboards. Is this a flaw in mathematics, or is it due to something physiological? One of the experts puts it this way: "We are faced with either a major biological discovery or else with the unpalatable conclusion that highly impressive results can arise as artifacts of the use of established methods." And so the fascinating search—and arguments—will go on.

A homemade remedy for the shortage of engineers is a-brewing. Experts think that perhaps as much as five percent can be added to our

reservoir of engineers by upgrading skilled workers. Home study and part-time education would play a big role. What's dramatizing this once again is the emergence of Roy T. Hurley as top man in the recent Curtiss-Wright deal with Studebaker-Packard. Hurley, chairman and president of Curtiss-Wright, never got beyond the public schools. He pulled himself up by correspondence courses and practical

experience in the shop. That wasn't unusual in the early days of the auto and aviation industries, but it's pretty rare in this era of fancy academic ribbons. The hunt for engineer-scientists, by the way, will be hotter than ever this fall, with inducements galore to lure male youngsters into those fields (in the U. S.—unlike Russia—young women don't spark at a scientific career).

PS NOTES: All TV networks now have their own versions of miniature cameras for candid work. Latest entry (by American Broadcasting Co.) is a 10-oz. job using a half-inch cable. It was developed from a West German device to inspect boiler tubes . . . A hormone drug (Releasin) is ready to counteract premature labor and childbirth, which often result in the infant's death. Initial cost: \$150 to \$175 for each case treated . . . Dr. C. M. Herzfeld of the National Bureau of Standards has an idea on how to store atomic energy: Freeze it in solids at around minus 460 F. The chilled atoms will combine when they warm up into "concentrated sources of power" . . . On the theory that the most prevalent and bothersome mental sickness (schizophrenia) may be due to errors in body chemistry, scientists are testing for it by urinalysis. Certain compounds seem to show when the illness is there.



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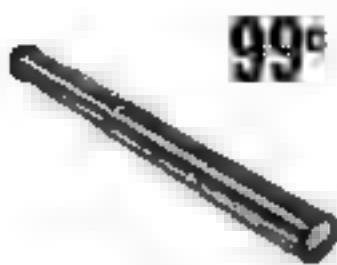
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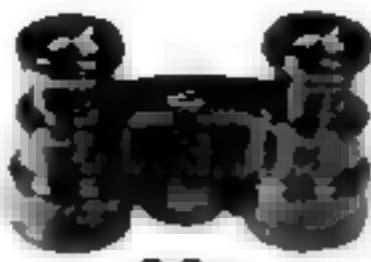
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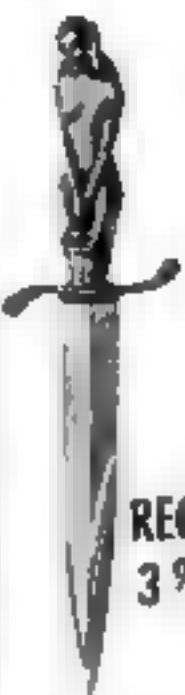
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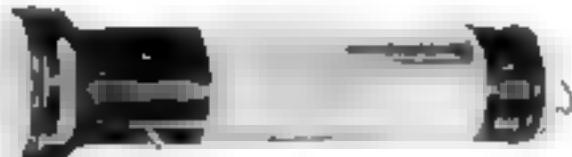
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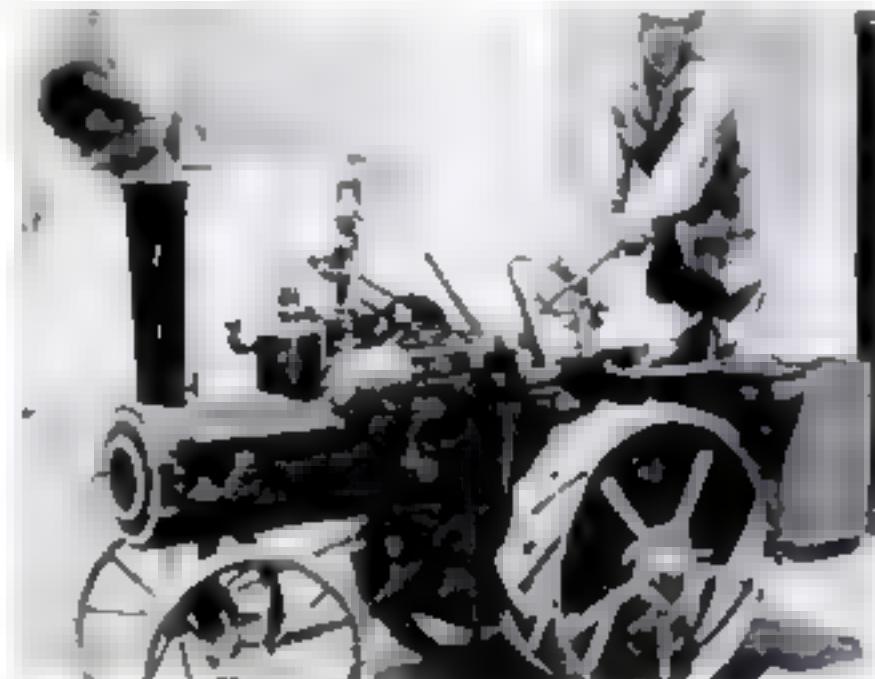


Club Cashes In on PS Idea. A money-raising plan was hatched when Director R. H. Lockwood and his Boys' Club of Martinez, Calif., read "How to Build This Outboard Hot Rod" (PS, Mar.

'58). Their first step was to build one, shown here during construction by the boys under Lockwood's guidance. The next step was selling it, with the profit going to buy more workshop equipment.



"Hot Rod" Rides Sidewalk. This power wagon built by newsboy-twins Gary and Larry Watson of Tacoma, Wash., travels their route at 12 m.p.h. Its four-cycle, 1½-hp. gas engine is V-belted to one rear wheel through a speed-reducing counter-shaft. One boy drives while the other throws papers from a soapbox trailer



Baby Farm Engine Really Runs. John E. Peters, a retired farmer of Inman, Kan., had to use memory and his scrap pile to build this pint-sized reproduction of a once-popular steam engine for threshing grain. The hobby version, complete with coal bin and a pop whistle, will make about four m.p.h. at full steam.

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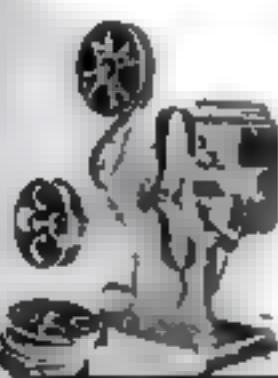
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25	16.90	8.65	4.60	1.65
26	17.20	8.80	4.85	1.70
27	17.55	8.95	4.75	1.75
28	18.00	9.20	4.85	1.80
29	18.50	9.45	5.00	1.85
30	19.05	9.70	5.15	1.90
31	19.70	10.05	5.35	1.95
32	20.40	10.40	5.55	2.00
33	21.25	10.85	5.75	2.10
34	22.25	11.35	6.00	2.20
35	23.25	11.85	6.30	2.30
36	24.40	12.45	6.60	2.40
37	25.70	13.10	6.95	2.55
38	27.15	13.85	7.35	2.70
39	28.75	14.70	7.80	2.85
40	30.50	15.55	8.25	3.00
41	32.35	16.50	8.75	3.15
42	34.40	17.55	9.30	3.35
43	36.60	18.85	9.90	3.55
44	39.05	19.80	10.55	3.75
45	41.70	21.25	11.25	4.00
46	44.55	22.75	12.05	4.25
47	47.70	24.35	12.90	4.50
48	51.20	26.10	13.85	4.80
49	55.05	28.10	14.90	5.20
50	59.40	30.30	16.05	5.60

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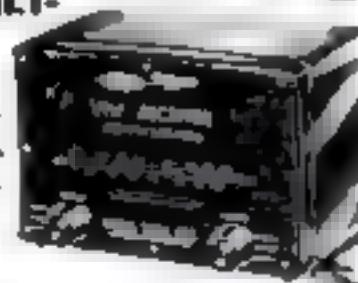
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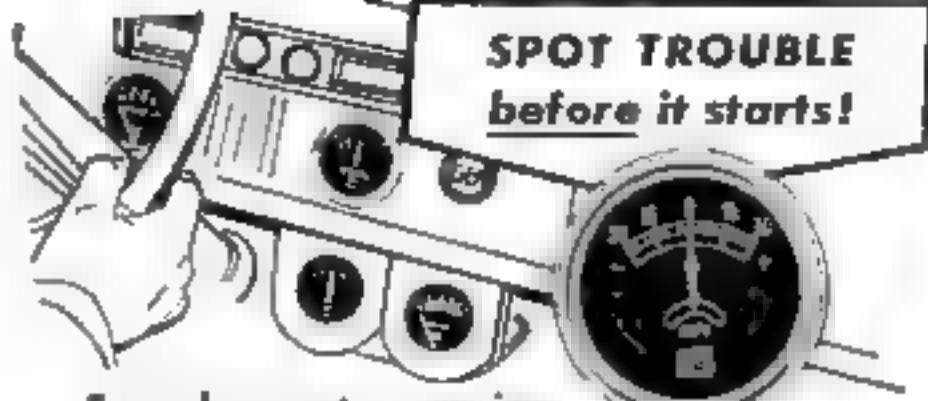
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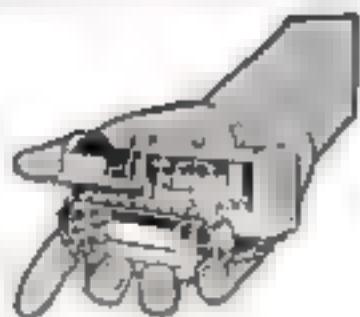


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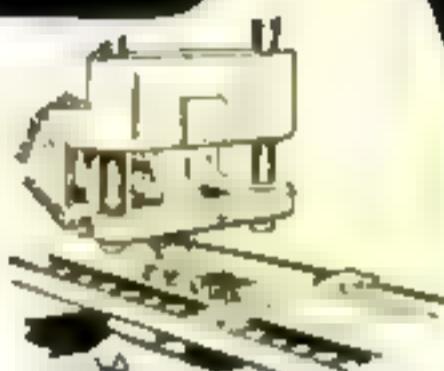
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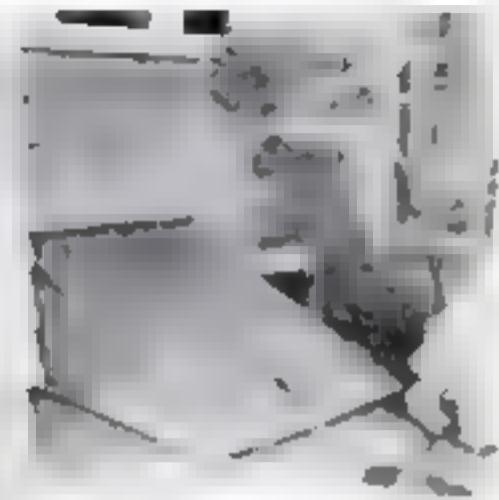
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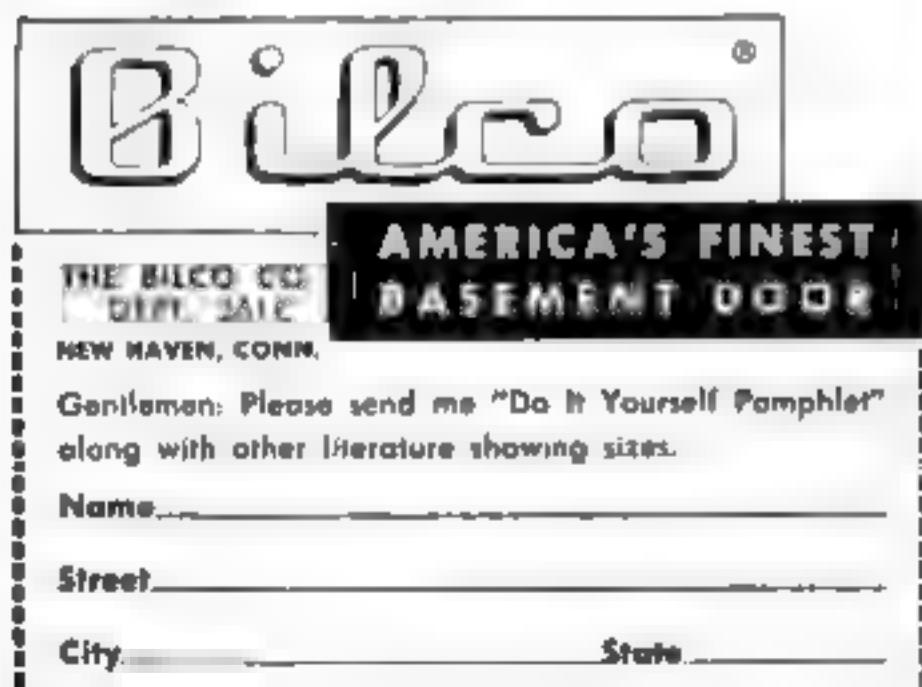
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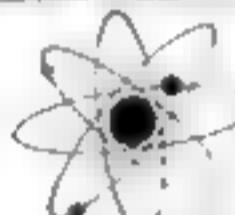
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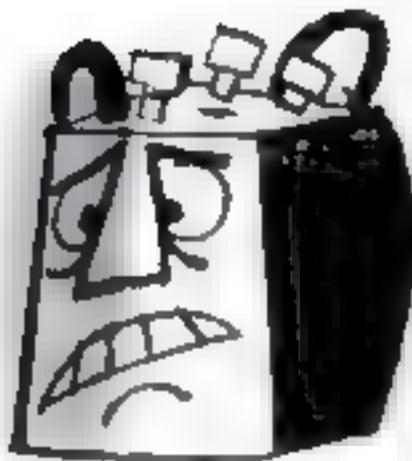
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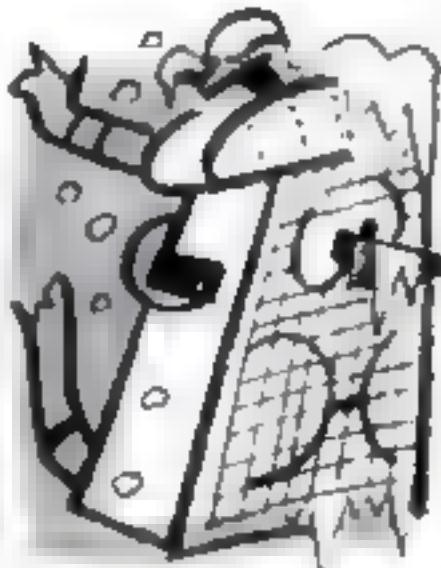
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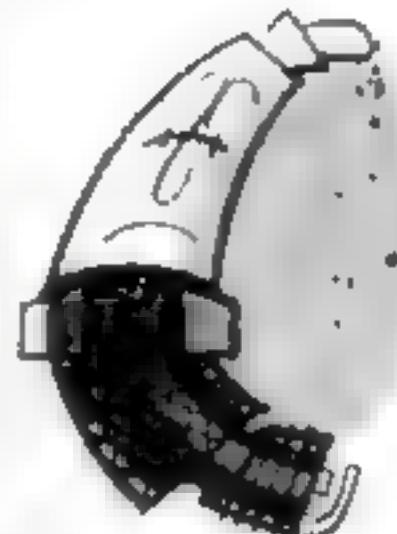
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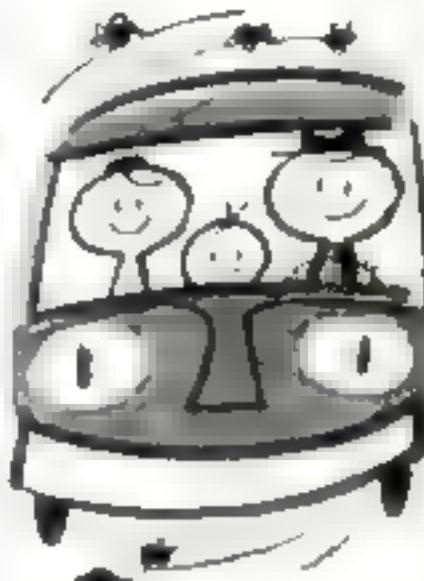
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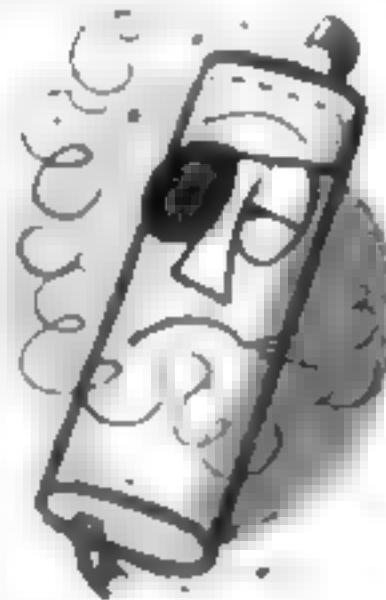
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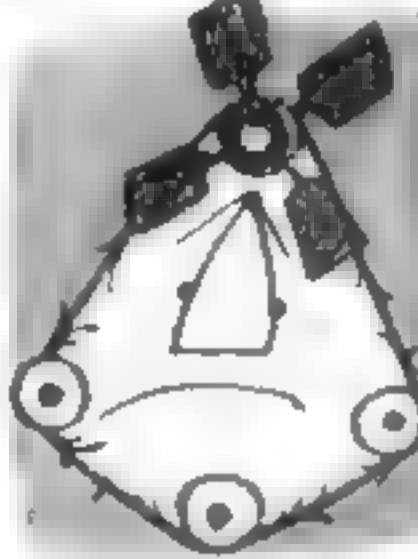
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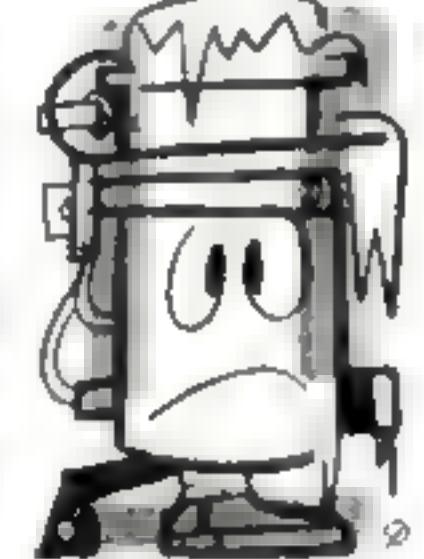
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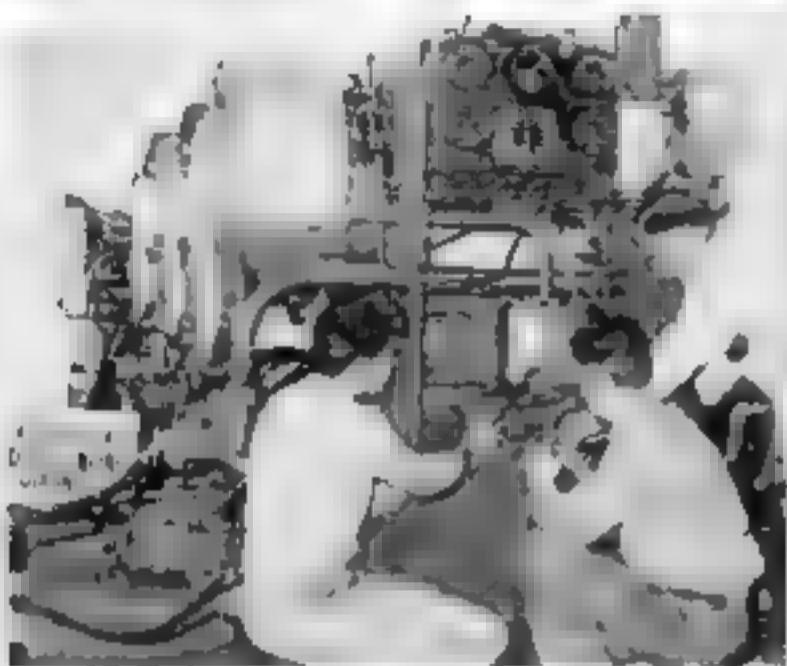
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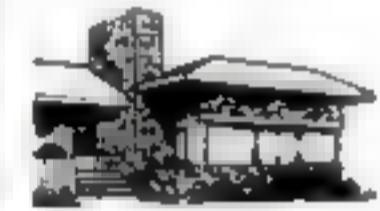
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... New type solid electrodes have no points to burn off. The "business" end of Life-Long Plug utilizes unique nickel-cadmium electrodes to produce faster hotter spark arc from 21 or more points and spreading around the full 360° circle. Life-Long Plugs have approximately 40 times more firing surface than conventional one-electrode plugs, giving more efficient, even combustion.

THE SHELL... Made of a new alloy developed specifically for Life-Long by modern metallurgy. Unlike old style 2-piece shells, the Life-Long shell is one precision-machined piece fused to the Ebanite insulator under tremendous hydraulic pressure and induction to make a positive seal. This prevents blow-by, major cause of failure in plugs with 2-part shells.

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"I certify that the set of self-cleaning, 21 pt. Life-Long Nickel-Cadmium Spark Plugs you will receive are identical to those used in my own car for over 100,000 miles. I guarantee that Life-Long Plugs will give you an immediate horsepower and mileage gain and will continue to fire clean, hot and steady without cleaning or regapping."

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Life-Long's revolutionary "ring of fire" principle is the first major improvement in plugs in 25 years. Instead of small "spot" spark arcing between the same two points, the Life-Long Plug makes a hot spark 400% to 500% greater in volume, spreading around the entire circumference of the solid electrode. The piston stroke of today's high-compression engines is so powerful that it can actually "blow out" the spark produced by old type plugs. Blowing out is impossible with Life-Long's full-circle spark.

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PLEASE NOTE The Life-Long spark plug is different in design from an "improved" plug but an entirely new engineering development.

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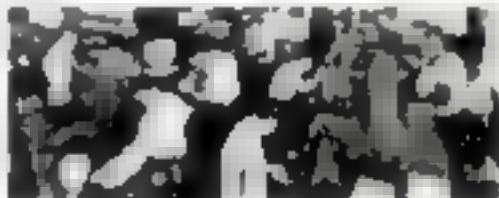
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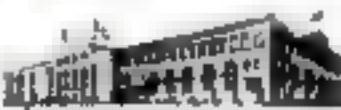
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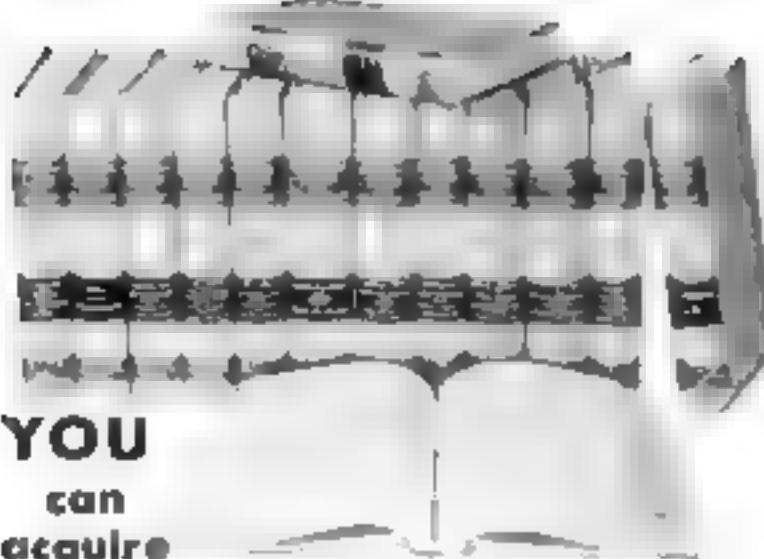
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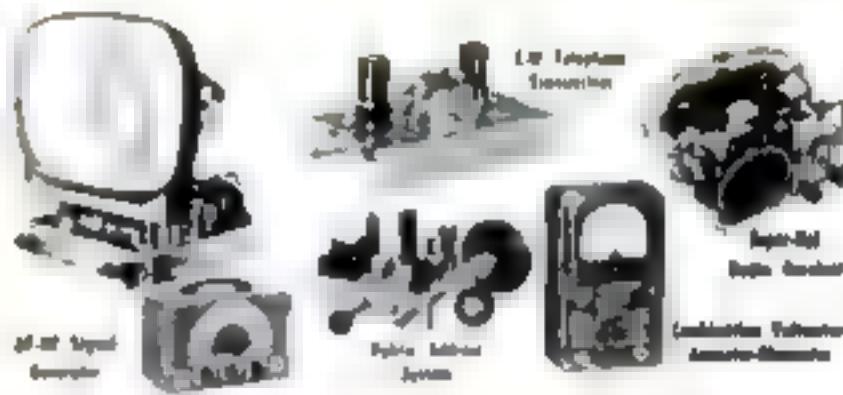
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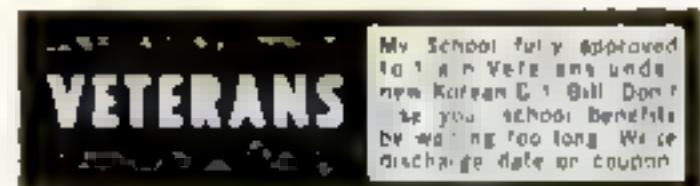
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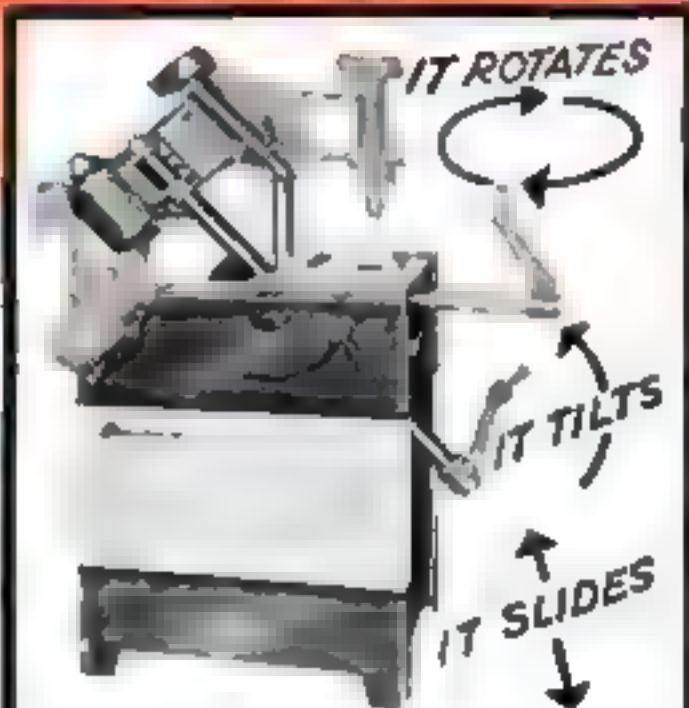
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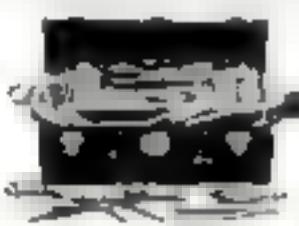
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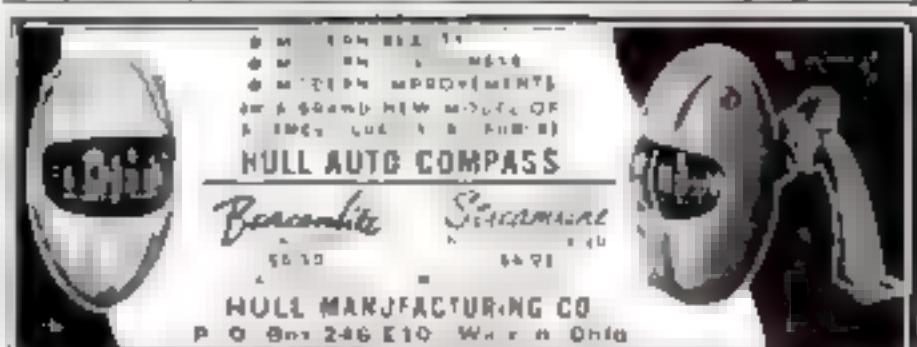
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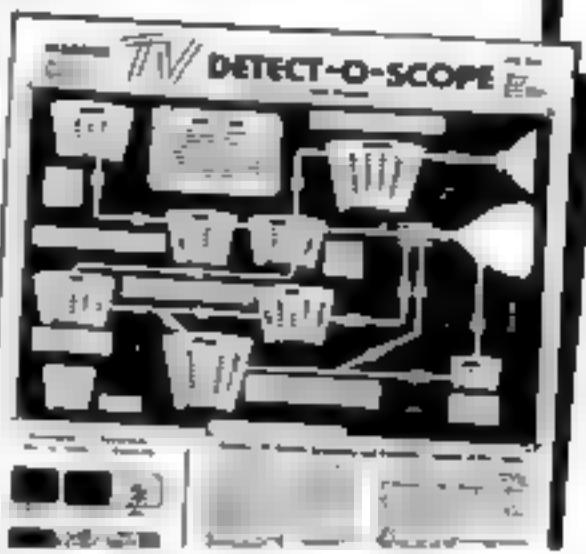
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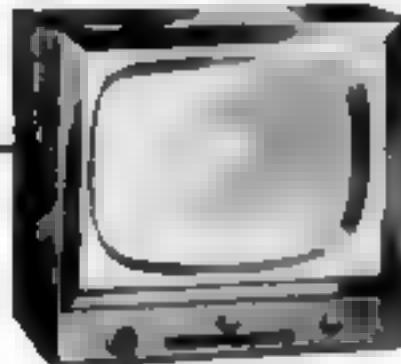
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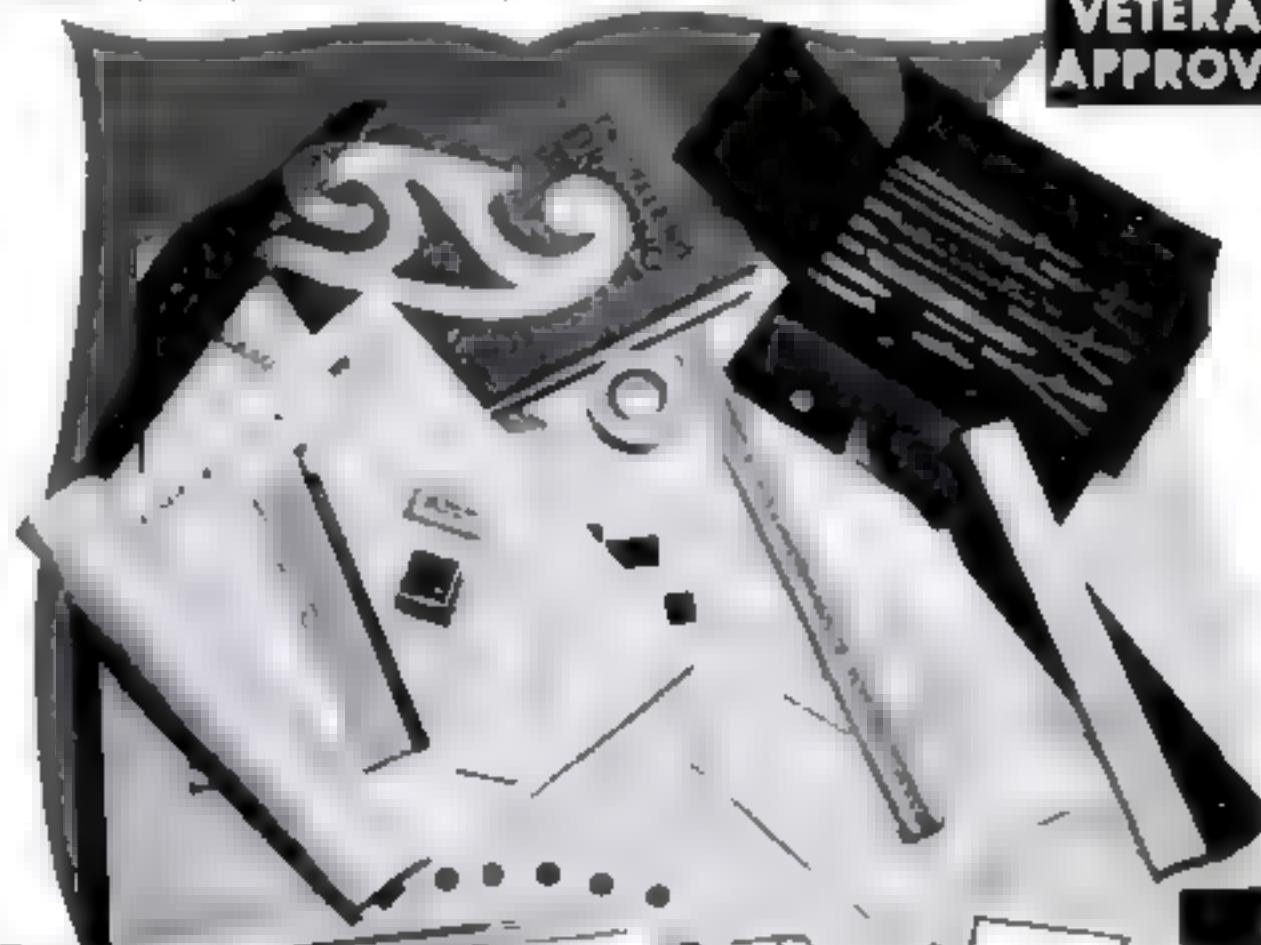
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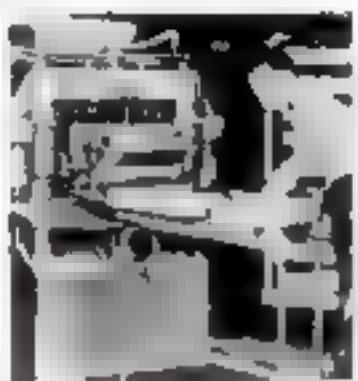
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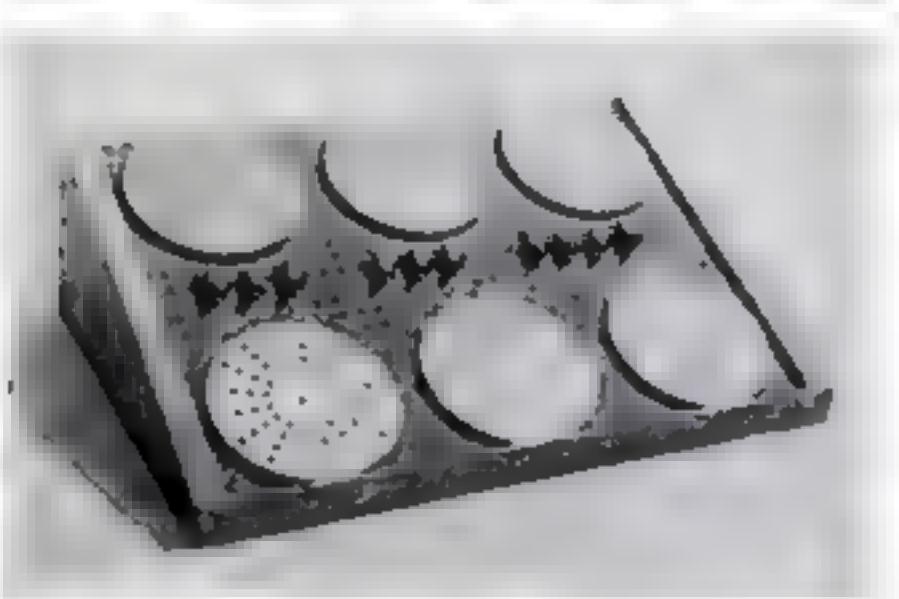
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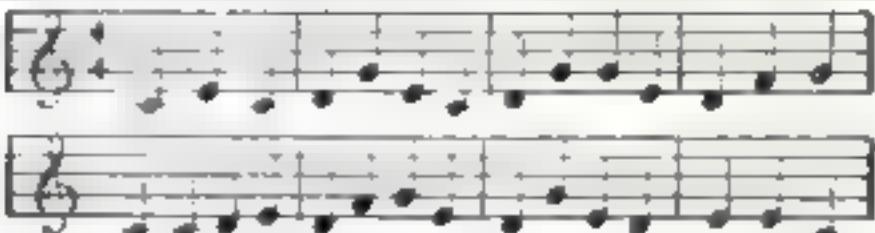
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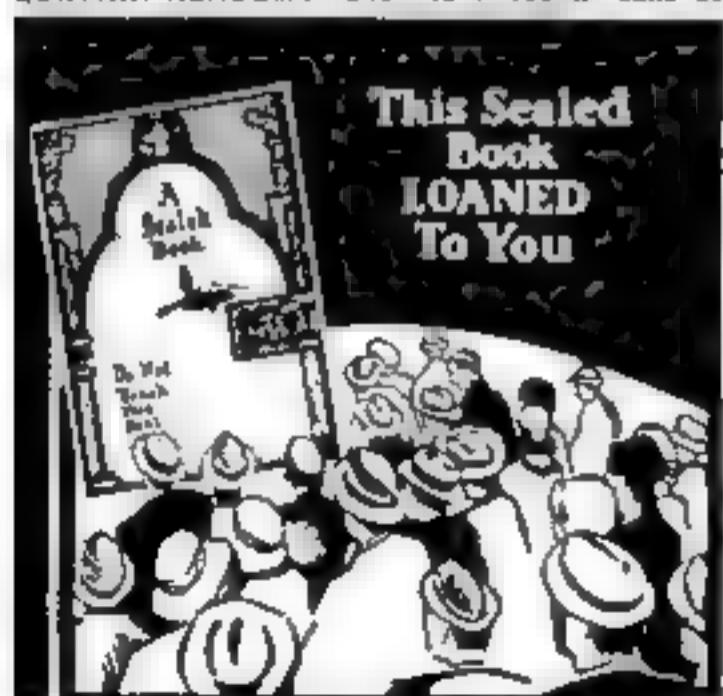
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850-18	8.45	760-15	8.45	825-18	9.35	900-20	10.45
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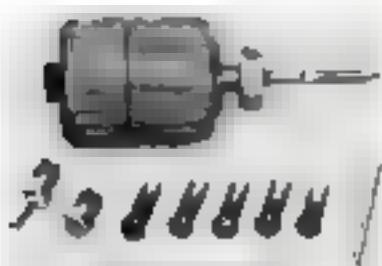
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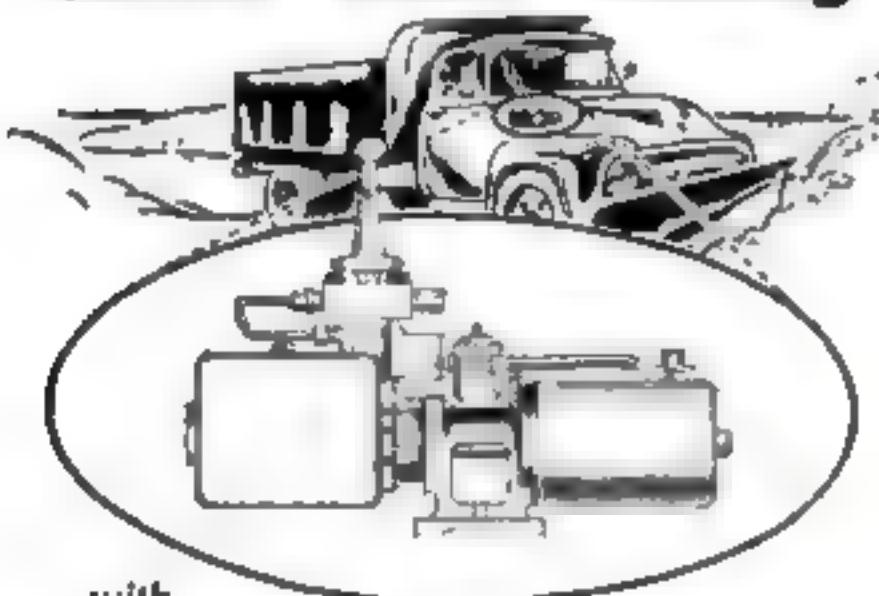
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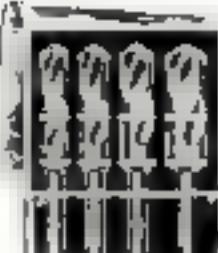
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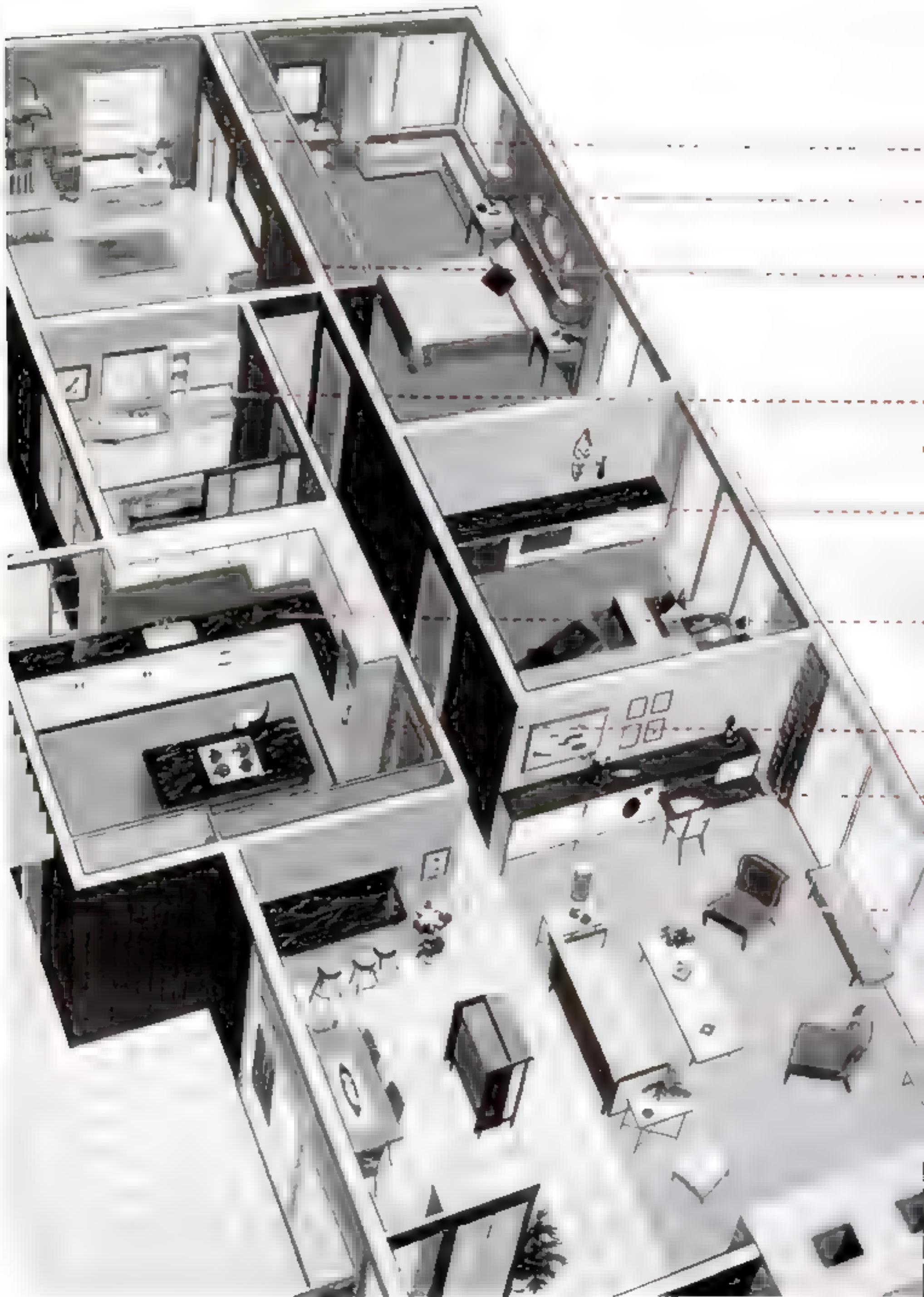
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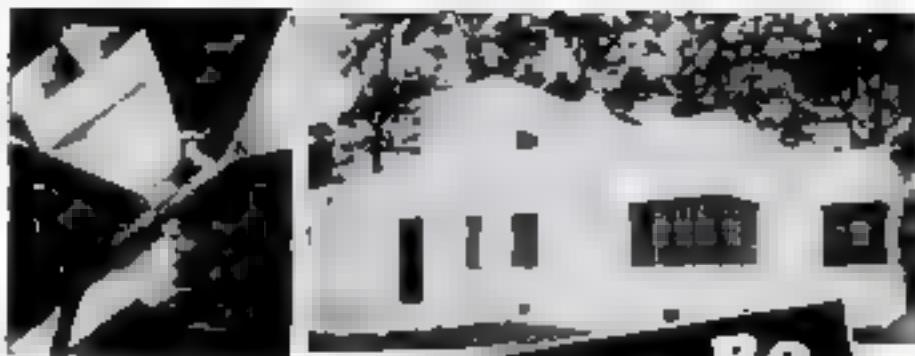
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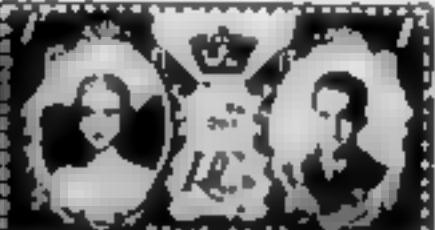
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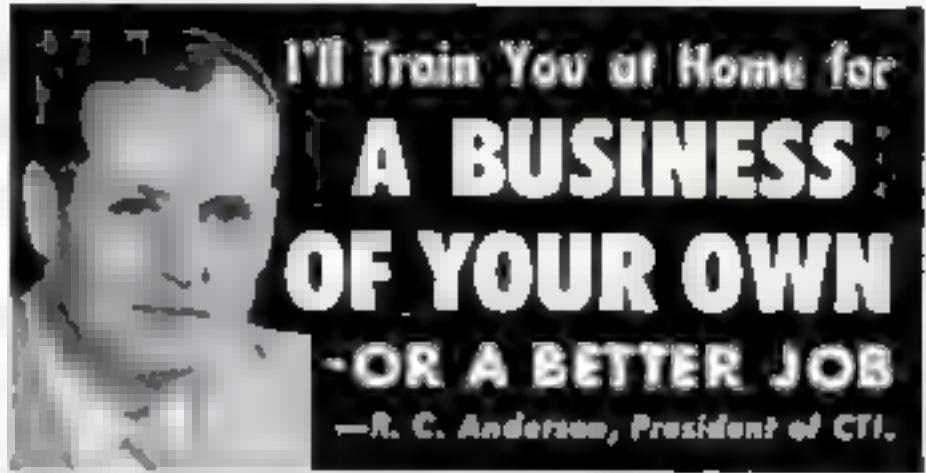
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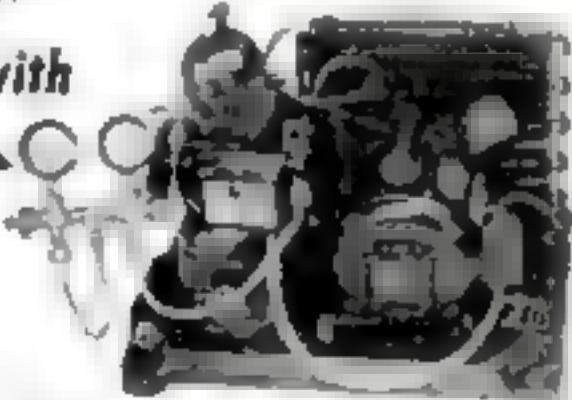
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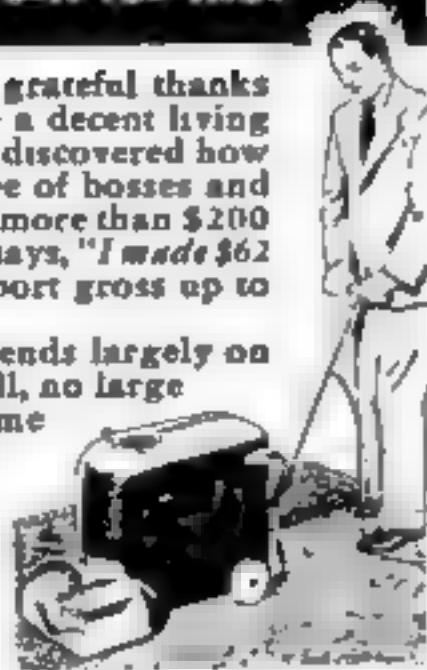
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12 Disc Wheel	120.75 semi-pneum. Tire 1.75" B.M.	2405 ea.
12 Disc Wheel	121.75 semi-pneum. Tire 1.75" B.M.	2425 ea.
12 Disc Wheel	122.75 semi-pneum. Tire 1.75" B.M.	2445 ea.
12 Disc Wheel	123.75 semi-pneum. Tire 1.75" B.M.	2465 ea.
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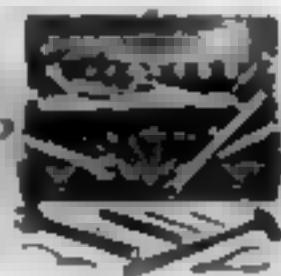
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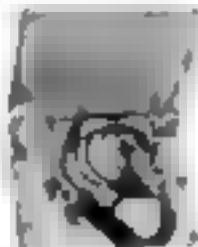
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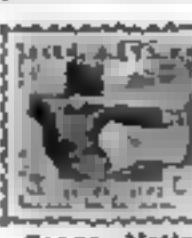
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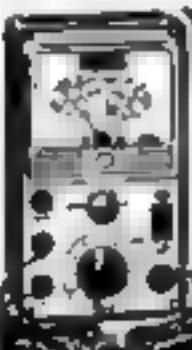


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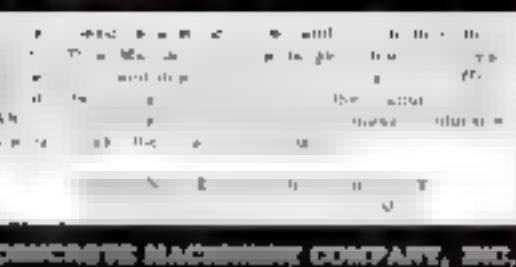
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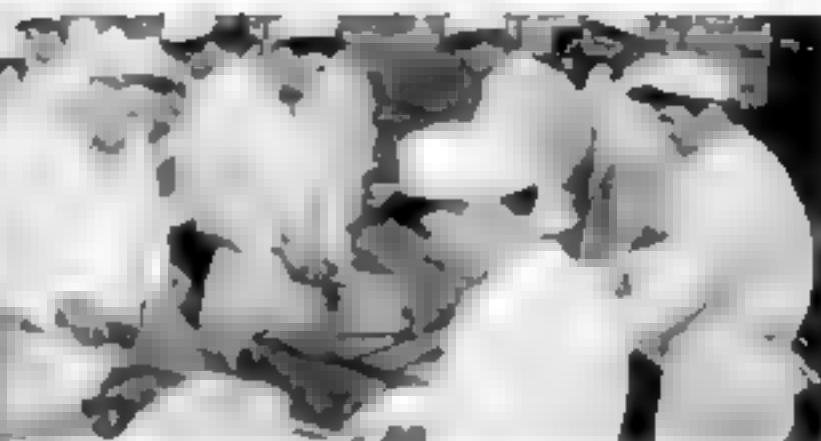
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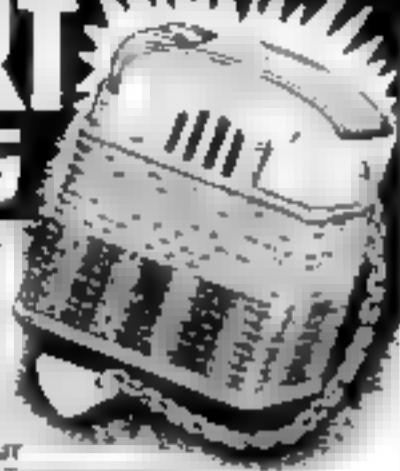
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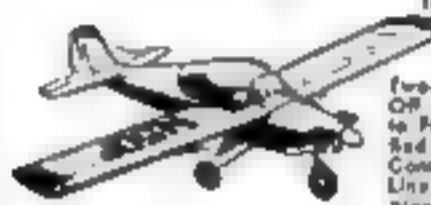


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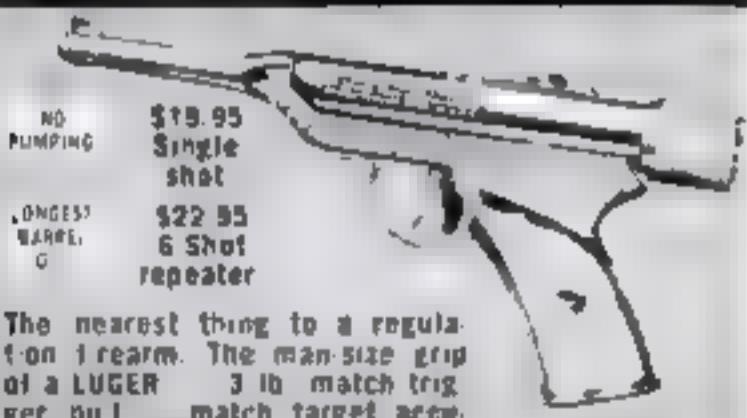


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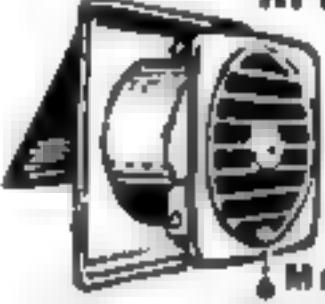


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GRAFLEX

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BEFORE-DARK PHOTO OF FOOTBALL FIELD—where the after-dark Headlamp Comparison Test photos,

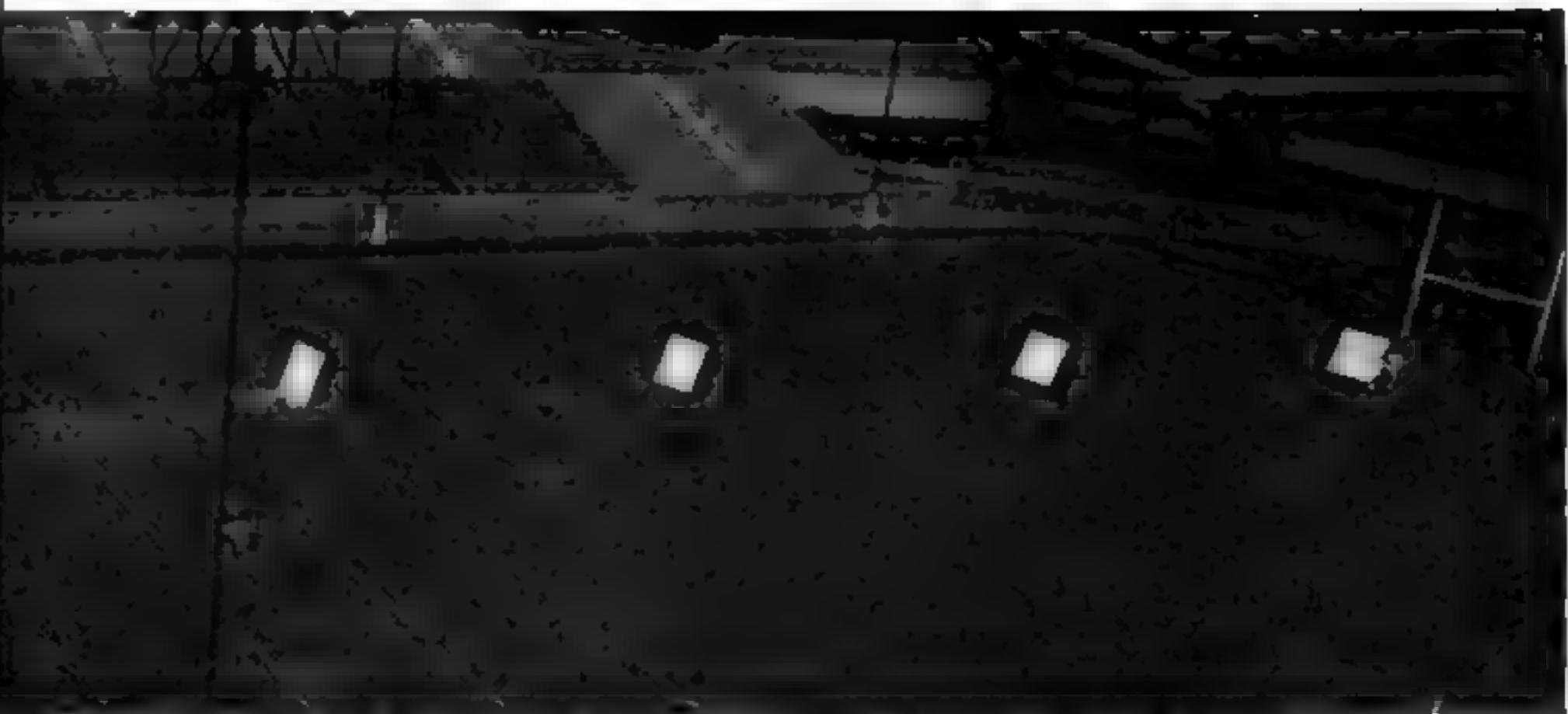
Now...twice the light for

300
FEET

OLDER TYPE SEALED BEAM HEADLAMPS—
Student barely visible at 300 feet.

300
FEET

NEW GENERAL ELECTRIC *All-Weather* HEADLAMPS—
Twice as much light at 300 feet and beyond!



below, were made. Student-model stands at the marker, a full 300 feet from the car headlamps.

safer driving at night!

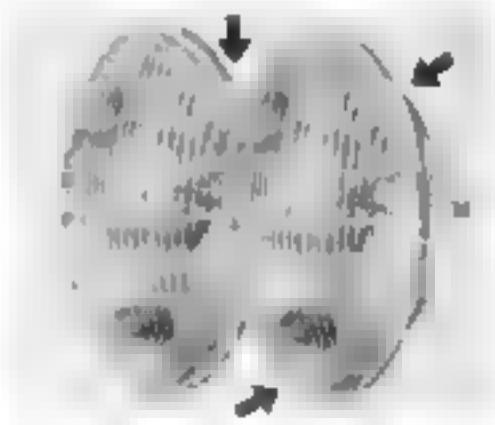
LOWER BEAM OF NEW G-E *All-Weather* HEADLAMPS GIVES TWICE THE LIGHT 300 FEET AHEAD ON YOUR SIDE OF THE ROAD!

Why 300 feet? Because at 300 feet, and at normal speeds, you should see objects clearly. Good visibility at that distance is easy with *upper* beams—yet, traffic conditions force you to rely most on the *lower* beam. That's why G. E. redesigned its headlamp lens, upped the wattage, redistributed light in the lower beam. The "Headlamp Comparison Test", pictured at left, shows that you see better at this critical seeing point with G-E *All-Weather* Headlamps—*photographic proof that you can get twice the light for safer driving at night!*

See Better In Fog, Rain, Snow. The special lower beam filament shield in General Electric *All-Weather* Headlamps blocks uncontrolled upward light, reduces kick-back glare, helps you see better in fog, rain and snow.

Is Accurate Aiming REALLY Important? Yes! Road shock and vibration can cause headlamps to become mis-aimed. Aimed high, headlamps glare

into the eyes of oncoming motorists. Aimed low, beams don't project far enough down the road. (If, at a point 25 feet ahead of your car, your headlamps are aimed only 3" low, you get half the light you should have at 300 feet!) But G-E *All-Weather* Headlamps have Aim-right Gizmos, (see arrows at right), that help dealers aim them quickly, accurately . . . even in daylight. So, for safer driving, better seeing in all weather, more accurate aiming, replace present headlamps with a pair of G-E *All-Weather* Headlamps today! General Electric Miniature Lamp Dept., Nela Park, Cleveland 12, Ohio.



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GENERAL  **ELECTRIC**

ACTION

*starts
with AC...*



hot tip spark plugs

CHANGE AT LEAST EVERY 10,000 MILES



AC SPARK PLUG  THE ELECTRONICS
DIVISION OF GENERAL MOTORS

...the spark plug others follow!

AC Spark Plugs paved the modern trend to high-compression engines and high-octane fuels! AC Spark Plugs pioneered the most impressive list of advances in ignition history! There's an out-ahead AC Hot Tip Spark Plug specifically designed to get the best performance from your car's engine. Insist on AC Spark Plugs.

FIRST with the stronger, one-piece heat sealed shell construction

FIRST in welded side electrode construction for better heat and electrical conductivity

FIRST to incorporate a resistor element for elimination of radio interference from ignition.

FIRST with fused metal-ceramic seal to stop center-wire compression leakage

FIRST in the use of unglazed insulator tip to resist lead attack.

FIRST with the aluminum oxide insulator in the United States — a patented AC composition!

FIRST to use greater "scavenging" area between insulator and shell.

FIRST with the long, thin, recessed, quick-heating insulator tip — the AC Hot Tip — an AC exclusive!

FIRST with the copper-core electrode to improve performance under special high-temperature operating conditions in commercial applications.

How Good Are the New Small Wheels?

By David R. Lindsay

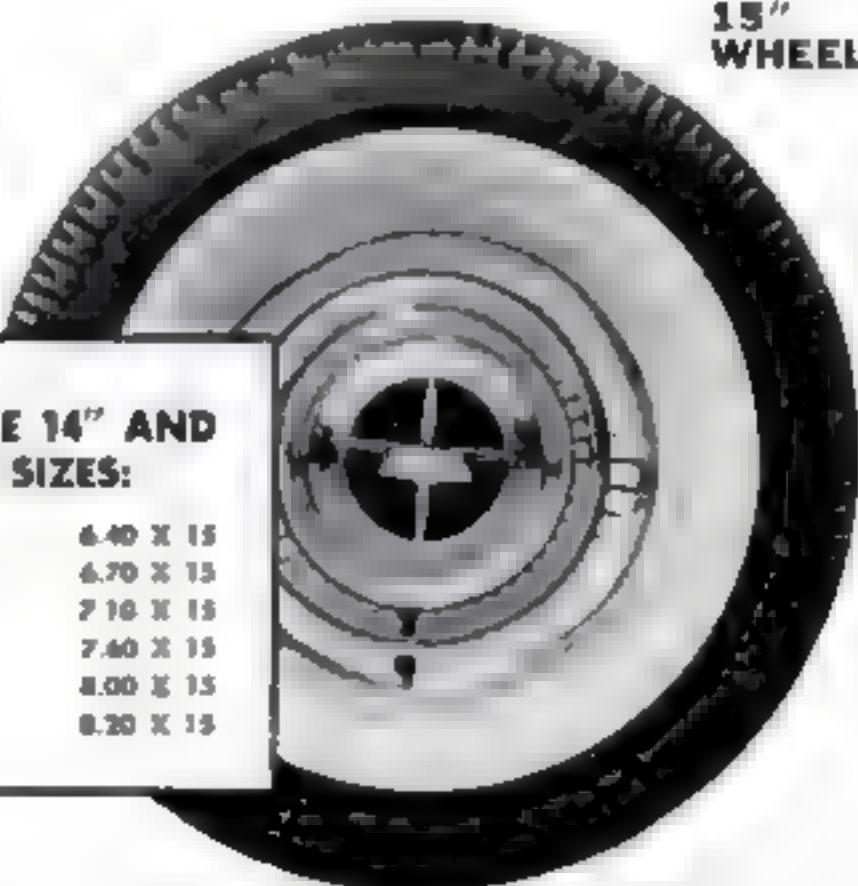
WHEN the parade of 1957 cars gets under way, a special blare of trumpets will call attention to their smaller wheels and the fat, low-pressure tires that go with them. The only 1957 cars that will not be equipped with them are Buick, Cadillac, Lincoln and Packard.

Tires are identified by tire width and wheel diameter, in inches. Measuring from the inside of the rim, the new wheels are 14 inches in diameter—one inch less than the present wheel size. Most of the small '57 cars will wear the new look, 7.50-by-14s instead of this year's 6.70-by-15s.

Ever since grandma doffed her duster 40 years ago, wheels have been getting smaller and tires bigger. It's part of the trend toward lower cars with smoother, softer rides. The decrease in overall



ROBUST-LOOKING TIRE fits new wheel; thin one, the 1956 rim. Decrease in diameter is more than made up for by the increase in volume.



COMPARABLE 14" AND 15" TIRE SIZES:

7.00 X 14	6.40 X 15
7.50 X 14	6.70 X 15
8.00 X 14	7.10 X 15
8.50 X 14	7.40 X 15
9.00 X 14	8.00 X 15
9.50 X 14	8.30 X 15

wheel-and-tire size has brought the cars down a few inches and helped to lower the center of gravity. The increase in tire size has resulted from an almost consistent movement toward lower pressure.

Improves traction. The lower the pressure, the more road shocks the tire absorbs and the more tread is in contact with the road. The increase in "print area," as the engineers call it, tends to improve traction and braking, which is why beach buggies use jumbo tires to ride on the sand. Conversely, increased print area also makes for harder steering and parking.

The long-term trend in tires, however, was not what interested designers in changing wheels. Lowness was their initial aim. Chrysler, for example, is lowering many of its 1957 models from three to five inches.

Insiders say that some stylists in Detroit wanted to jump all the way from 15- to 13-inch wheels, but auto engineers raised a holler. Brakes, they said, wouldn't fit without a radical and extremely costly reworking job.

Even with 15-inch wheels, brakes have been a headache in recent years. The horsepower race and the rush toward turning automobiles into parlor cars have not helped. It takes more brake, obviously, to stop a car going fast than one going slow and similarly more to stop a heavy car than a light one. New gadgets, like automatic transmissions and air conditioners, don't subtract weight. Stopping an ordinary automobile from 70 m.p.h. generates enough heat to melt a pound of iron. Without sufficient air circulation to dissipate the heat, the car simply won't stop.

The result of this conflict between looks and machinery was a compromise

on 14-inch wheels. When the size was fixed, the tire companies went to work. They had been waiting for a chance to lower pressure again. The tires in use for the last eight or nine years have averaged 24 pounds' pressure. The new tires will average 22 pounds.

Lower pressure, more tire. To support the same loads at the lower pressure, tires had to be made bigger. When the

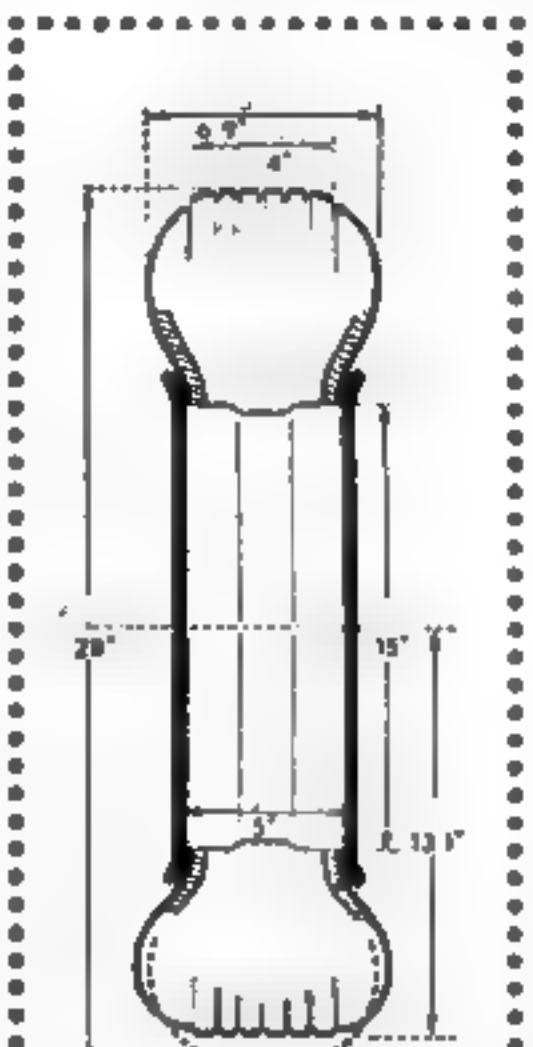
whole wheel-and-tire assembly was finished, the auto designers had gained a maximum of half an inch in lowness; but because the tires are chunkier than they were last year, in some cases the drop is only .3 or .4 of an inch. The rest of the lowering had to be done elsewhere.

The new fat tires pleased stylists for another reason: they were said to fit in better with the new big "envelopes" (bodies to you). Maybe so, but when an engineer at Chrysler pointed to a 1956 sedan parked next to a testing garage and asked me what was special about it, I couldn't tell. It turned out that it had been fitted with the new wheels and tires. When it was pointed out to me, I could see the difference.

Changes axle ratios.

Mechanically, the change in wheel and tire size makes several small adjustments necessary. The weights are only negligibly different from last year, but the circumferences of the new tires are enough smaller to involve slight changes in speedometers and in axle ratios. Along with the lower pressure there's what would be roughly a five-percent increase in steering effort—if everything else remained the same. On most 1957 cars little remains the same, so that even without power steering, drivers probably won't have to work any harder.

Rides "softer." From the viewpoint



COMPARISON of small-car tire dimensions: '57 figures are in color. Different makes of car and tire vary a bit from standard size.

Evolution of Passenger Car Tire Sizes



NOMINAL WIDTH	3"	3½"	4.00	4.50	4.75	5.25	5.50	6.00	6.70	7.50
OUTSIDE DIA.	30.4	31.7	30.4	30.7	29.5	29.2	29.0	28.5	28.0	27.15
INFLATION PRESSURE	65	50	32	40	40	35	32	28	24	22
RIM DIA.	24	23	21	21	19	18	17	16	15	14
DATE	1916	1917	1925	1928	1929	1932	1933	1934	1947	1957

*This was a clincher tire—its bead had a hooked lip to hold it in a flange on the rim.

CONSISTENT TREND in tire styles for the past four decades is shown in the chart above.

The figures given are for the average small car; for 1957 they give tire size on 5-inch rim.

of a driver and his passengers, the differences will be in the softness of the ride and in traction. These are real advantages, though the changes brought about by a two-pound drop in pressure are not overwhelming. I drove a 1956 Plymouth over a pock-marked road and across several rail crossings, first with 15-inch wheel-and-tire assemblies and then with 14-inch. Perhaps I was fooling myself, but I thought I felt the difference. I know I tensed automatically as I gunned the car before hitting the tracks the second time, but that Plymouth seemed to take the bumps as smoothly as if they had been mirages. I could hear some tire noise, but I wasn't conscious of any bounce.

Traction is trickier to compare and I didn't attempt it. Tire experts say, any-

way, that traction is affected more by tread design than by print area, and most '57 tires will have new treads.

When wheel changes were made before, not all cars made them the same year. It's a good bet that the four 1957 holdouts will go to 14-inchers before the others change to 13.

13-inchers coming? Asked if 13-inch wheels were now being contemplated, the chief engineer of one of the biggest tire companies said my guess was as good as his. Auto designers I queried were just as indefinite. But one brake engineer commented that, given enough time and money, you could make a brake fit darn near any wheel. Brakes rather than road clearance, he suggested, were a limiting factor at present.

END

A quarter-century before its time

WHEN the 14-inch wheels and tires were announced for 1957, The General Tire & Rubber Co. lost no time in boasting that the auto industry was finally catching up with General after 25 years. A quarter-century ago, General introduced its "Jumbo" extra-low pressure balloons to help soften the jolten ride of the cars of that day. Those big doughnuts were designed for 14-inch wheels although cars then carried 17-inchers. General made special wheels and sold the wheels and tires together; a set of five cost from \$89.50 to \$120 with your old wheels and tires as trade-in. In contrast, today five new 14-inch wheels without the tires would come to

about \$75 list price, complete, they would run up over \$200.

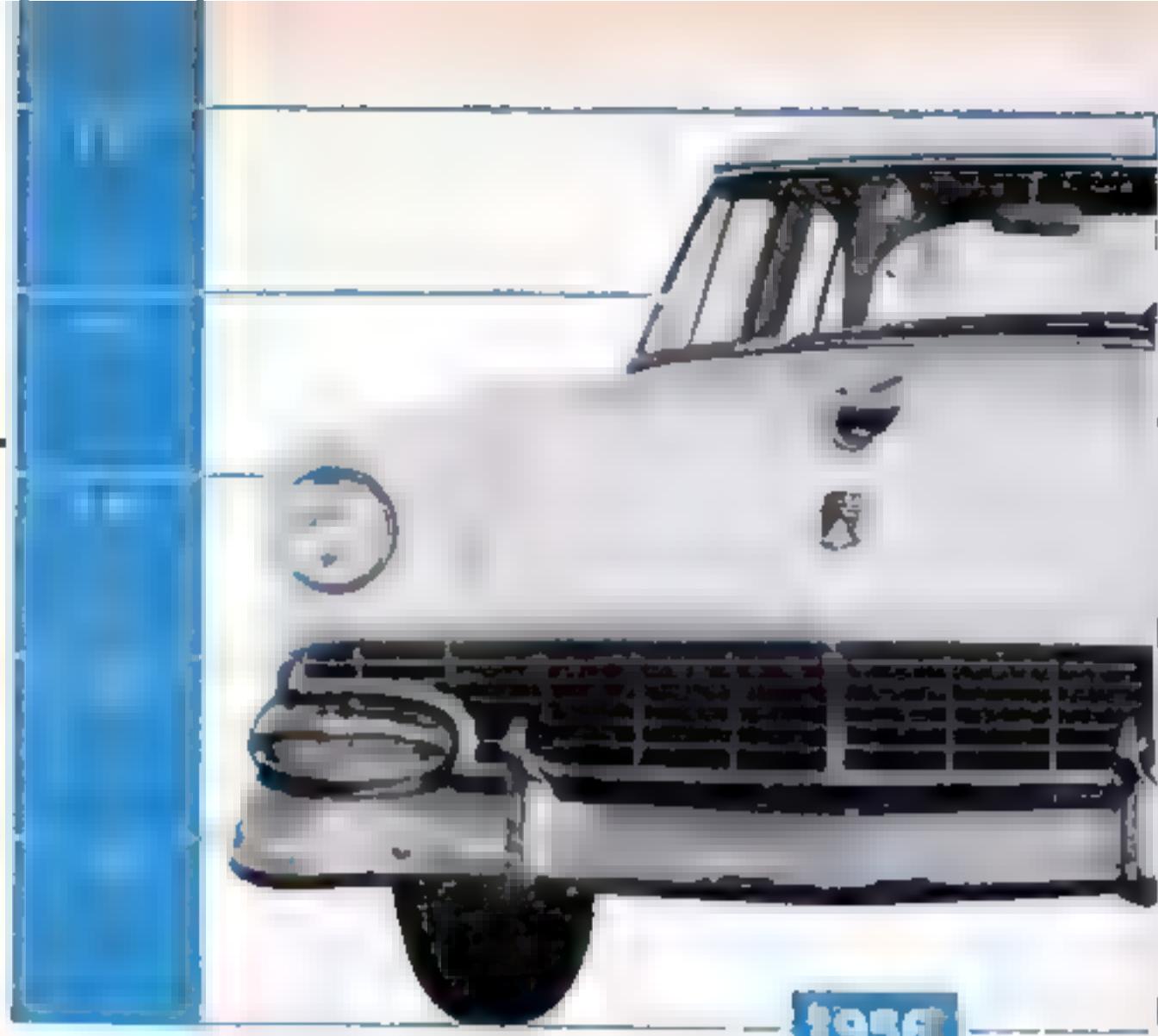
Some of the old Jumbos, recapped over and over because new ones haven't been available since 1950, are still in use on beach buggies. With only 12 to 16 pounds pressure, those fatties take a car over sand and through mud that would sink ordinary tires to the hubcaps.



By squeezing out an inch here and half-inch there, Ford engineered a roomy car that's head-high to a pygmy—and it has a cracking good ride to boot

By Devon Francis

COVER PHOTO BY HUBERT LUCKETT



1956

PS Report on 1957 Cars

The New FORD

ONE gate to the high-walled Ford Proving Ground in suburban Detroit, Mich., fronts on a street called Oakwood Boulevard, and across the way from it is a plush hotel named the Dearborn Inn. Many months ago this gate was closed and padlocked.

There was good reason. Outsiders with more than an idle interest in the 1957 Ford cars—like, for instance, guys in Detroit who make competitive cars—had an

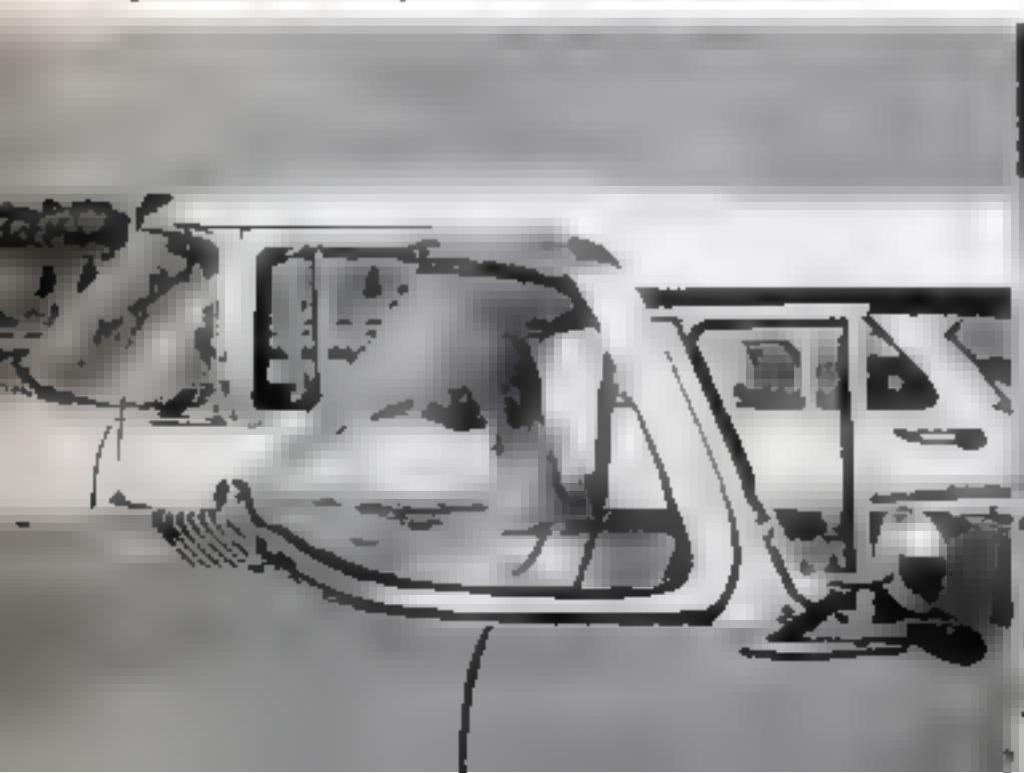
annoying habit of checking into the hotel with cameras. The cameras had telephoto lenses suited to taking pictures through a hole in the wall when the cars, then a-horning, were being tested.

Too good to tell. Ford figured that it had too big a prize package of goodies in its new stable of cars to be charitable with snoopers.

It had. When the new Fords were unveiled late last month, they were spank-

NEW REAR-CANTED POST, in contrast to '56's vertical one (background), increases wrap-around area of the windshield. The air intake for the passenger compartment is on the cowl.

HINGING HOOD AT FORWARD EDGE instead of near windshield is described as safety factor, in case latch suddenly lets go at high speed. It also gives easier access to rear of engine.





—Only 4 Feet 8 Inches High

ing new from one bumper to the other.

- They were inches lower, and longer.
- They had flaring fins at the stern, a harbinger of things to come in the rest of the auto industry this month and next.
- They had the new 14-inch wheels, with fatter, lower-pressure tires.
- They incorporated some new safety features.
- And, of course, they had more power under the hood.

SAFETY ASH TRAY has no projections to stab a front-seat passenger in sudden stops. Its cover is the eyelid type. Recessed controls on the panel board also are designed for safety.

It's "model change year" for this car, the world's second-biggest seller. The 1957 version represents another Herculean bid by Ford to overtake its arch-rival, Chevrolet.

The new Ford has two king-size differences from '56—looks and ride.

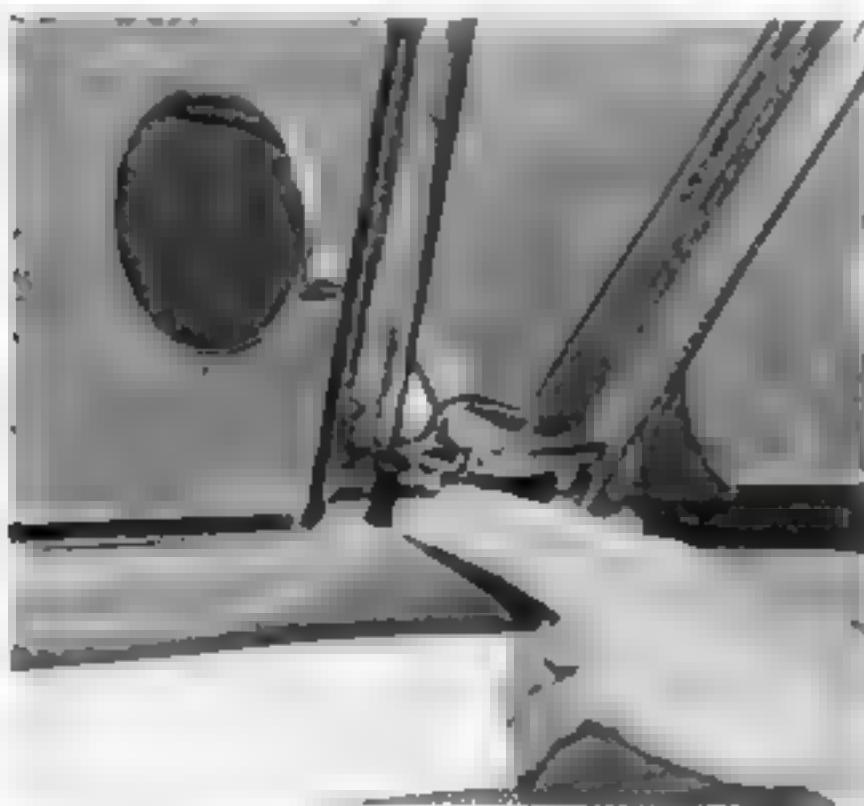
Picture a car that's head-high only to a Belgian Congo pygmy, and you have the new Ford. The Fairlane line is down *four inches* for an overall height of

RABBIT-EAR TAIL FINS look pronounced but actually are conservative compared with some that are on cars yet to be announced. Extra-deep rear bumper eliminates need for bumper guards.





STEP-DOWN FLOOR in rear, like that in yesterday's Hudson, has effect of raising the seat height. Car height in Mainline and Customline sedans is 57 inches, in hardtops it's 58.



DOOR LOCK PLUNGER has been moved forward from rear of door to the vent window area. New mounting of outside rear view mirror prevents the vent from interfering with line of sight.



BETTER ANTI-ROLL characteristics show on the hard, flat curves. Here car rounds a 150-foot-radius test-track turn at 30 m.p.h. Lowered height, outboard spring anchorage help.

56 inches. The hardtops are down 2.4 inches for the same net height. That's a drop, by the way, of a full half-foot since the first of the postwar Fords made their appearance back in 1948.

Slide-rule magic. How the engineers met the demands of the stylists without making the driver and passengers ride prone is a story of slide-rule legerdemain. There was just so much room for the designers to work with. Roughly, it was 425 cubic feet, measuring from roof to ground in a car six feet wide. Into that box had to go the propelling machinery, running gear, frame, body and the passengers. Finally, there had to be ground clearance.

The result had to be satisfactory not to the sports-car cultists but to the fussy customer in Bangor, Beloit or Berkeley who was afflicted with claustrophobia.

Well, here's what Ford did.

For the first time in its history, it designed a car that seats the driver and

NEXT MONTH:

Comparing the 1957 Ford, Chevrolet, Plymouth

his passengers *inside* the frame rails. The rails bulge out like those in the elegant Continental. In the front the floor is flush. In the rear it "steps down" like that in the Hudson up to a couple of years ago.

It seemed inevitable that the headroom would suffer from the lowered roof line. A yardstick tells a different story—the headroom in front is almost four-tenths of an inch greater than in 1956; behind it's only three-tenths of an inch less.

The gain in the front headroom comes partly from dropping the seat height by more than two inches. The depressed pan in the rear actually permits a seat that's a half-inch higher off the floor than in '56.



Flaring fins, eyebrow headlights and a jaunty tuck in beltline help identify the 1957 Ford.

The machinery had to go somewhere. There was an engine, a transmission, a drive shaft, a differential, and all the attendant accouterments such as the steering wheel. Not to mention springs.

Springs are a nagging headache to automobile engineers. They must have room to compress and rebound. That means perhaps 15 cubic feet beneath a car's floor pan that is nothing but pure air—wasted space.

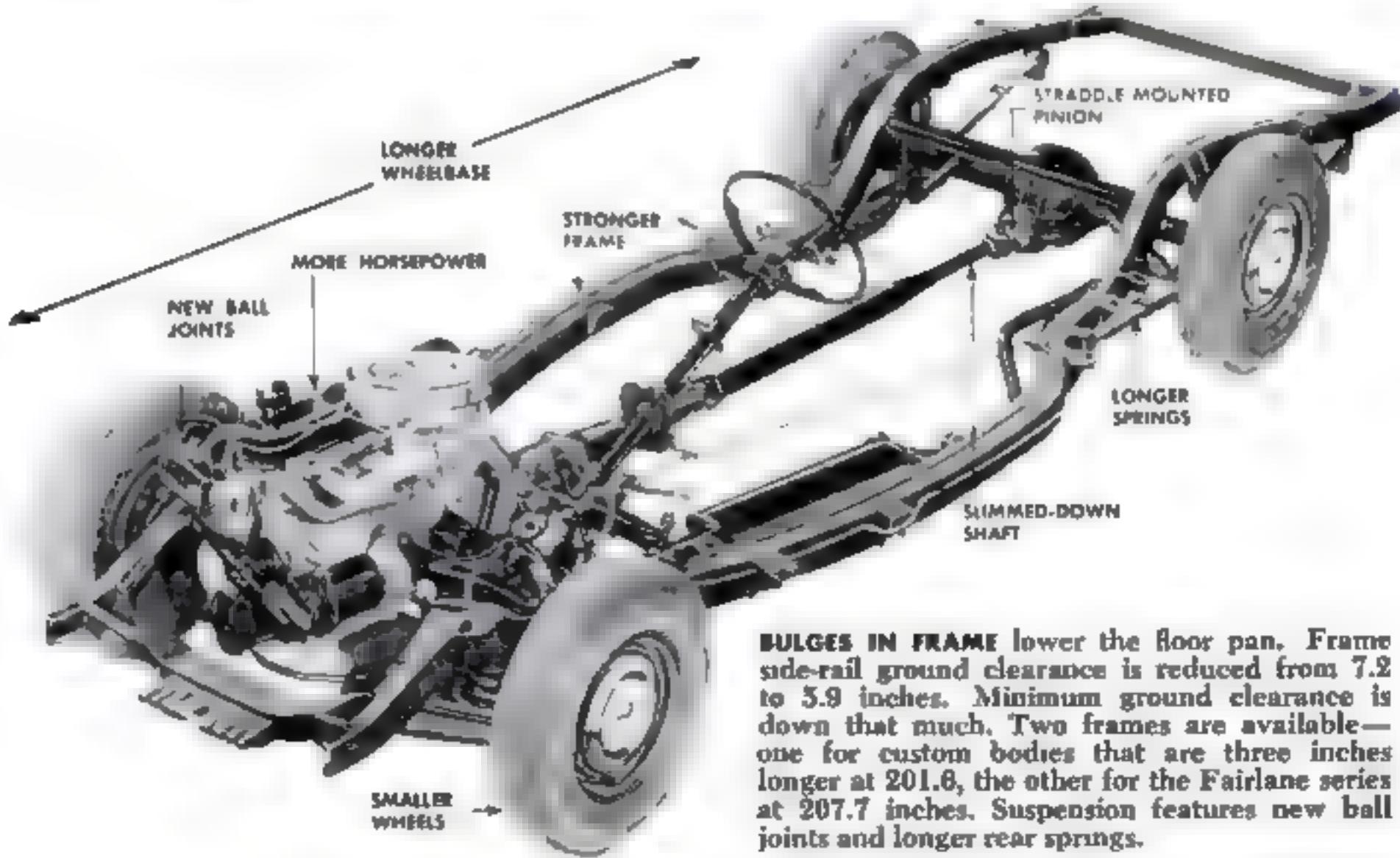
The space problem is most critical under the passenger compartment. That's

the subdivision that must accommodate the transmission, drive shaft and differential housing *and* the rear springs.

Ford got around the rear-spring problem in part by putting the front anchorage for the leaves on the outside of the frame instead of beneath it. That saved about three inches. It remained to reduce slightly the amount of space given the springs to operate and making up for it by cushioning the body against "bottoming" with extra-soft rubber bumpers.

[Continued on page 248]

Longer, lower chassis was designed for longer, lower Fords



BULGES IN FRAME lower the floor pan. Frame side-rail ground clearance is reduced from 7.2 to 3.9 inches. Minimum ground clearance is down that much. Two frames are available—one for custom bodies that are three inches longer at 201.8, the other for the Fairlane series at 207.7 inches. Suspension features new ball joints and longer rear springs.

A Boy's Dream: The World's Longest Bridge

Inspired by Brooklyn Bridge as a lad, today David B. Steinman is the master bridge builder.

By Ira Wolfert



David B. Steinman

POETS who see the great steel and concrete bridges of modern times as new, wildly beautiful creatures fathered by man are not indulging in fantasy altogether. For a bridge at times is almost alive. The best way to see this is to look over the shoulder of bridge builder David B. Steinman while he is at work.

POETS who see the great steel and concrete bridges of modern times as new, wildly beautiful creatures fathered by man are not indulging in fantasy altogether. For a bridge at times is almost alive. The best way to see this is to look over the shoulder of bridge builder David B. Steinman while he is at work.

Mackinac Bridge is expected to open right on

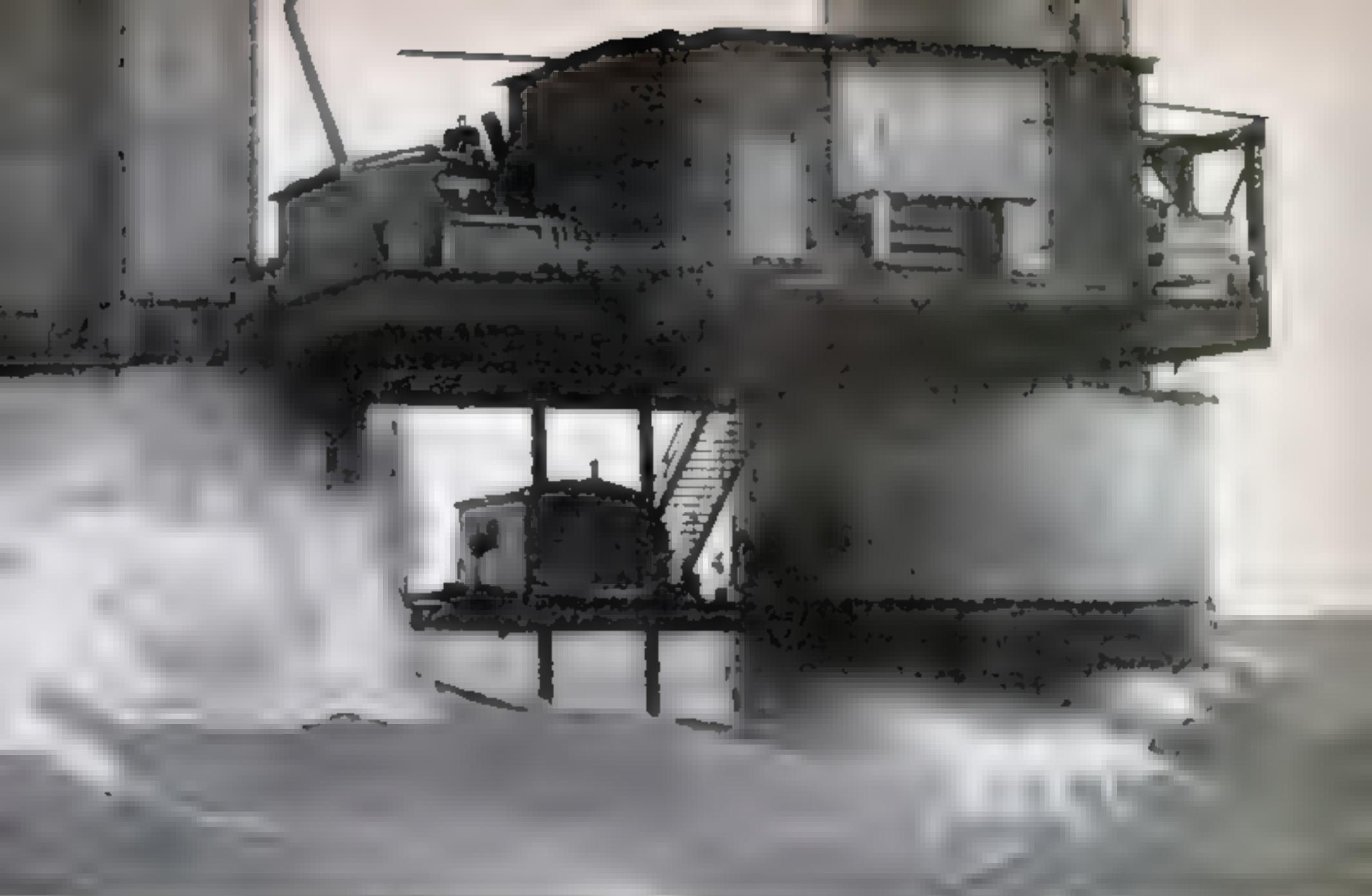
Dr. Steinman has built bridges on five continents, and in doing so has made many of the most important new discoveries about bridges. They seem to come naturally to him. He cannot remember when he was not fascinated by bridges. He was born in New York's lower East Side, in the shadow of Brook-



CATWALK CABLES are laid across bottom of water then hoisted to tops of 552-foot towers.



CABLES IN PLACE, catwalk itself, of wire netting, is laid between them. Workmen start at



schedule—November 1957—in spite of such weather hazards as 40-foot waves, ice and tornadoes.

lyn Bridge, which was built by the Roebling family.

Steinman, one of seven sons of a factory worker, grew up undernourished in a three-room tenement. But all through those desperate years the great bridge was an inspiration to him.

Steinman determined to build spans

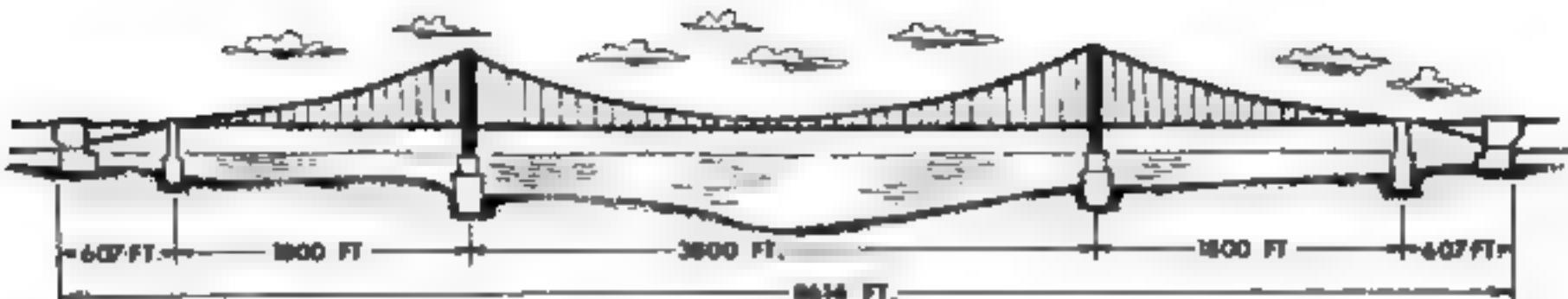
like it. A brilliant student, he graduated *summa cum laude* from the College of the City of New York in 1906. A scholarship enabled him to win his Master's and Ph.D. degrees in engineering at Columbia, and he went on to become one of the world's foremost bridge builders.

The walls of the reception room in his



top of each bridge tower, lay netting out toward middle. Above, high over Mackinac

Straits, ends of catwalk are about to meet, joining Michigan's mainland with its peninsula.



MACKINAC BRIDGE will be the longest suspension bridge in the world, between anchorages—that is, between the ends of the cables that hold up the roadway. This distance is 8,614 feet, or 1.64 miles. Another way of measuring suspension bridges is by the distance of the center span—the longest single span, between the two towers. Using this method the Golden Gate

Bridge over the entrance to San Francisco Bay walks off with top honors. It's the world's only bridge with a longer center span (4,200 feet) than the Mackinac's (3,800). Third place in the bridge competition goes to the George Washington Bridge over the Hudson River. Its 3,500-foot-long center span connects New York's Manhattan Island with New Jersey.

New York office, appropriately enough in the Roebling Building, are covered with diplomas, honorary degrees, medals and plaques—honors that designing and building 300 bridges have won for him all over the globe

When you meet Dr. Steinman you do not find him sitting in the midst of his honors, you find him in a plain little room hardly larger than a cubbyhole. Dr.

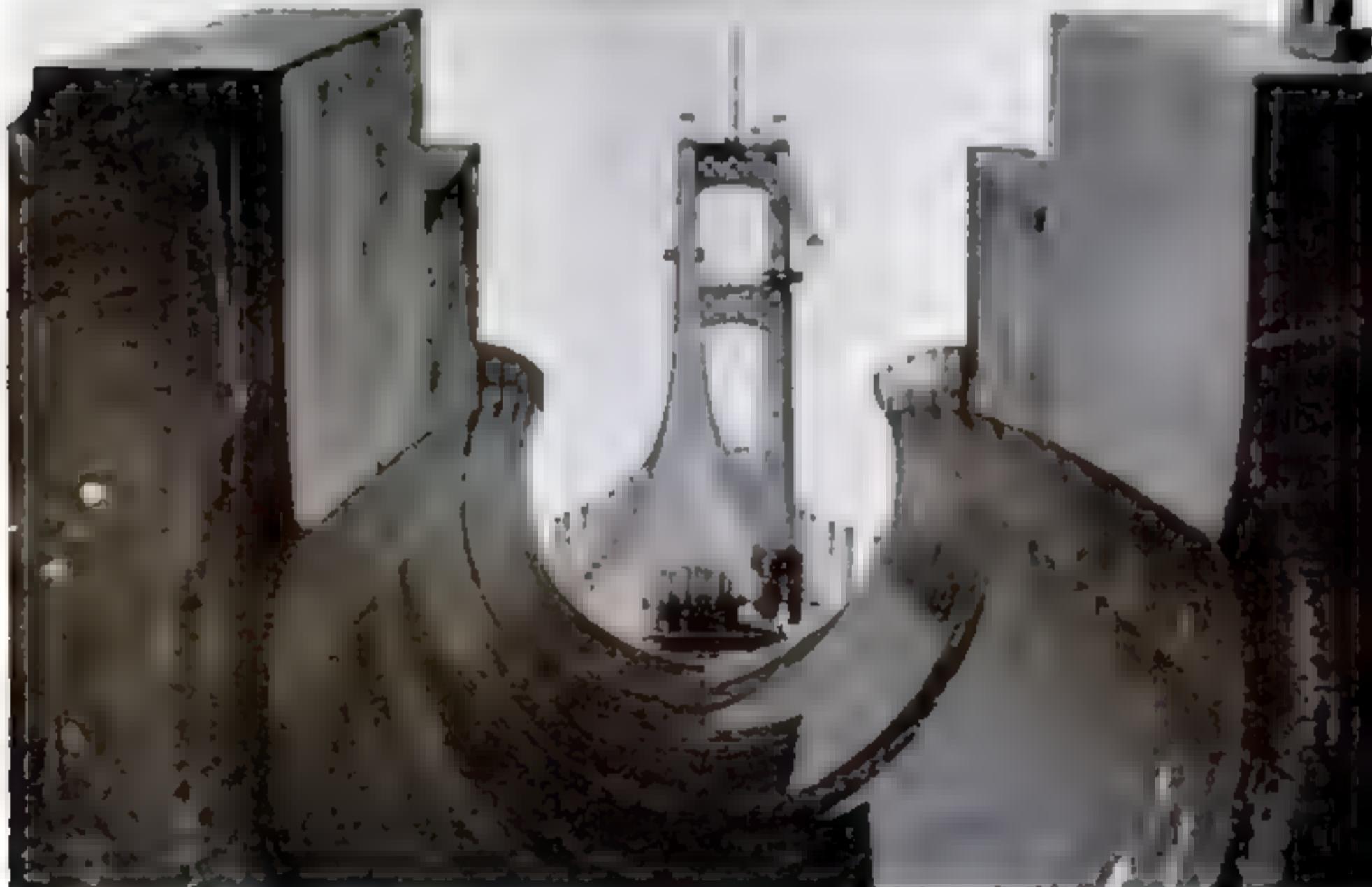
ONE CATWALK COMPLETED is shown from top of one tower. Other catwalk (to right) has just been begun. This photo was made through the

Steinman is short, frail-looking, diffident with strangers.

He is 70 now, but the Brooklyn Bridge still inspires him. He once wrote a book, *The Builders of the Bridge*, about the Roeblings. His most treasured task, he says, was the recent enlarging of Brooklyn Bridge to double its capacity.

Steinman launched himself from desk space he rented for \$10 a month. With

saddle (foreground) that will eventually hold one of the cables that will suspend roadway. Suspension cables will be two feet in diameter.





BOTH CATWALKS COMPLETED, the spinning of the suspension cables begins. Big wheels (top), riding on overhead cables, travel back and

forth across bridge, taking four wires each trip. They move until they have carried the 12,580 wires that form each suspension cable.

Holton D. Robinson he entered an international competition to build the Florianópolis Bridge in Brazil. Their design was revolutionary, creating four times as great rigidity with two thirds as much steel. It not only won the competition but put the new team at the top of bridge designing firms.

Steinman never lost that position. Chief among his many significant advances in bridge design are: his Mount Hope Bridge between Newport and Providence, R. I.; his St. Johns Bridge in Portland, Ore.; the Thousand Islands International Bridge; his designs for what will be the most gigantic bridge in the world, to cross the Messina Strait between Italy and Sicily.

I went up to Mackinac Straits in Michigan to see in life what I had seen on paper in his office—a bridge he is build-

ing now, which he regards as the most imaginative and successful of his career.

The length of the Mackinac Bridge is five miles, and it crosses four miles of water to connect the main part of Michigan and its forest-covered northern peninsula. From anchorage to anchorage it is the longest suspension bridge in the world. When opened next year its suspension span will be the second largest in the world—3,800 feet. The span of the Golden Gate Bridge, the world's champion, is 4,200 feet. The Mackinac's cables are anchored at each end in concrete foundations each bigger than a football field; the concrete alone in both weighs 350,000 tons—not much less than all the steel and concrete in New York's Empire State Building.

It will also cost more than any other

[Continued on page 252]



'Don't Stay

That's the warning of Federal agents in their crackdown on illegal "pep pill" peddling.

If you think you may doze off behind the wheel of your car, science has something to keep you awake. But in the next breath, scientists say, "Don't take it. You might kill yourself."

The answer to this paradox is simple: Drugs can hop up your reactions beautifully—something that the Air Force long ago learned. But drugs can't keep your judgment sharp enough, and on a highway that's vital. Just ask the trucking industry.

The truckers lately have had enough painful experience with stay-awake medicine to cooperate with the government in stamping out this kind of suicide. Here's the story.

By John K. Lagemann

THE man behind the wheel of the big truck reached into his shirt pocket for a tiny, heart-shaped pill and let it jingle in his palm.

"Here, my friend, is our driver for the next 200 miles," he told the helper beside him, and clapped the pill into his mouth.

His helper gulped, too, but only to swallow his feelings. The pill was a "Benny" or "co-pilot"—truckers' slang for Benzedrine, Dexedrine or any of numerous other drug preparations containing a powerful brain stimulant called amphetamine sulphate. The helper was an undercover agent of the Federal Food and Drug Administration.

Operating mainly in three states, North and South Carolina and Georgia, the agents found Bennies being peddled in roadside cafes and drugstores along every main

Awake to Die'

highway. On evidence they collected, the Justice Department took 22 criminal actions against 42 individuals. As this article went to press, U. S. attorneys had won every case they had presented and had only four more to go.

Bennies differ from the mildly stimulating caffeine-base pills that are sold legally without a doctor's prescription. Amphetamine, the stimulating agent in Bennies and other pep pills, is so powerful that it wakes deeply anesthetized dogs, and gives second wind to wheezy racing nags. In people it stimulates the brain, speeds the heart, reduces appetite and produces feelings of alertness and well-being.

But it has its hidden price tag. Here's how George P. Lerrick, Commissioner of the Food and Drug Administration, spelled it out to the Senate Subcommittee on Narcotics: "The acute toxic effects of amphetamine commonly include restlessness, dizziness, increased reflexes, tremor, insomnia, talkativeness, tension, and in addition confusion, assaultiveness, increased libido, hallucinations, delirium, anxiety, panic states, and suicidal or homicidal tendencies."

Under the influence of Bennies, a driver can go hours beyond the normal point of physical exhaustion. Protective symptoms of drowsiness and fatigue disappear. He feels like a million dollars. But the letdown can be sudden: Without warning, he may collapse at the wheel.

This is evidently what happened to 19-year-old Larry Allen Rowley. Driving a diesel rig, Larry snatched only a few hours' sleep on a 1,500-mile grind from Minnesota to Florida. On the way he wrote his younger brother, "I have been driving 42½ hours now without any sleep. I only stop to eat and fuel up, and then away I go. I am taking a lot of pills to keep me awake..."

Sixteen miles south of Fayette, Ala-

bama, Larry suddenly slumped into unconsciousness, and the truck plunged through a bridge abutment at 70 miles per hour, flew 40 feet through the air and buried itself up to the windshield in the river bank. A half-empty bottle of Bennies was found near Larry's body.

Bennies produce hallucinations. A driver taking too many may see things that aren't there, or fail to see what is actually there. Last February in Colorado, Patrolmen Melvin Phillips and Floyd Gresham, cruising on Route 40, signaled a refrigerator truck to a halt. It stopped well off the pavement on the



1 TOO MANY HOURS BEHIND THE WHEEL . . . **1** too many onrushing headlights . . . too much engine roar and drub of wheels on paving joints. But there's a good little hash house 20 miles down the road. They peddle a sure-fire cure for what ails a dog-tired truckie . . .

shoulder of the road, and the police drew up behind to make a routine inspection. The patrolmen and the truck driver were sitting in the patrol car, filling out an inspection form, when the patrol car was smashed into a pancake under the impact of a diesel tanker that hurtled into the rear at 60 miles an hour.

Tracks revealed that the driver of the tanker truck had run off the pavement more than a mile behind. He steered his speeding truck straight along the shoul-

der till he rammed the parked patrol car and truck. Did he imagine he was passing the vehicles, or didn't he see them? Nobody will ever know because, like the other three men, he was killed instantly.

Eight Benzedrine tablets were found in a vial in his shirt pocket and another 22 tablets in his bag. Deputy James H. Cole of the Colorado State Police said traces of the drug were found in the driver's body.

"Police pay far too little attention to Bennies as an accident factor," says

they posed as wildcatters, operating an old trailer truck. But most of their leads were picked up from buddies while working for trucking firms. They found the life strenuous.

"I lost 12 pounds in two weeks," one agent told me. "I lived in a boarding house with eight other drivers. Bennies were swapped around like chewing gum among kids."

"According to law, a truck driver has to have eight hours of rest between every 10 hours on the job. But driving is a



COST A BUCK A DOZEN, these "Benny" pills.

It's highway robbery, but who cares. Gulp one of them down, with or without Java, and you're as good as a first-class recap job. What's another 500 miles . . . another 12 hours at the wheel . . . you're feeling "fine" . . .



HOW'D IT HAPPEN? The hopped-up but groggy driver thought he saw stalled car looming up dead ahead and took to the ditch trying to miss it. But a State Trooper saw the whole thing—the road was clear, there wasn't any stalled car. Another victim of the Bennies.

Captain Singleton Sheaffer, commander of the State Police detail that patrols the Pennsylvania Turnpike.

And of the drivers: "When drivers realize what Bennies can do, most of them have the good sense to leave them alone. The recent FDA investigation did worlds of good. When word got around, there was a noticeable slackening of truck accidents in which the driver goofed off."

The undercover FDA agents went to company driving schools, mixed with truckers to learn drivers' lingo and job problems, got instruction from an FBI agent on undercover operations. At times

lonesome job and instead of hitting the sack, a lot of the guys spent their time off drinking, playing poker or going on the town. Sometimes when the phone hauled you up for a run it was hard to see how you could get downstairs, much less drive a truck for 10 hours. At such times most of the fellows used a pill."

It wasn't hard for the FDA agents to find out where to buy the pills. In an Anderson, S. C., roadside cafe and pinball emporium, the manager and a couple of waitresses sold Bennies at a dollar a dozen—the going price. On U. S. Route 29 near Royston, Georgia, FDA agents bought three dozen Bennies. A

fellow trucker complained that his son was buying Bennies at a truck stop at Rural Hall, N. C. Agents came in, ordered chile, bought dozens of Bennies from the proprietor and his sister. When the agents declared they wanted to buy Bennies in big lots "to make a killing up north," they got them by the thousands in North Wilkesboro, N. C. To allay suspicion the agents sometimes expressed fear of being caught. "Don't worry," one seller told them, "the Feds are supposed to check up, but they never do."



Though the mark-up is high on bootleg Bennies, nobody gets rich selling them, and there is no evidence of rings or syndicates. A crooked druggist buying amphetamine pills from wholesale drug firms at two to three dollars for a 1,000-pill bottle sells it to a peddler for \$30 to \$50. The peddler gets 10 cents a pill or a dollar a dozen. Legitimate druggists, who are in the vast majority, do not sell such drugs without seeing a doctor's prescription.

To use their purchases as court evidence, the FDA had to prove that the pills had moved across state lines. The labels had usually been sponged off the bottles. But just as every typewriter produces slightly different characters, every pill-making machine leaves certain tiny die marks. Government scientists, examining the pills under the microscope, were able to trace each batch of Bennies

to the drug company that manufactured it, and thus prove that they had crossed state lines.

The FDA crackdown was undertaken primarily to call attention to the danger and to alert local and state authorities nationwide to stricter enforcement.

The fact that individuals selling to truck drivers were singled out doesn't mean that truck drivers are the only customers. Bennies are used by industrial workers on overtime, college students cramming for exams, salesmen, and professional men. Heavy drinkers use the pills to cure hangovers. Taking Bennies to stay awake often leads users to take barbiturates so that they can go to sleep. This is burning the candle at both ends and in the middle, too.

According to Commissioner Lerrick, there is a definite connection between Bennies and juvenile delinquency—as well as many forms of adult crime.

Criminals young and old use Bennies to bolster their courage. The pills make the

user feel clever, daring, all-powerful.

Many truck drivers and others who take Bennies are perfectly normal people who have a job to do and who try to keep going after running out of energy. But when you keep going on energy borrowed from Bennies, you pay an exorbitant rate of interest.

The U. S. Air Force has done intensive research on fatigue. In long-range bombers, crews must stay alert at their posts for 30- and 40-hour stretches. In Washington, I asked Dr. Alfred H. Lawton, Air Force medical director, what means science could offer for reducing fatigue.

"There are lots of drugs that will give a short pickup," he said. "But when a drug improves reaction time it is apt to impair judgment. In the long haul, we've never found anything that's better than a cup of black coffee."

END

How Big Is a Billion?



AT A very early time man must have been conscious of numbers—the number of his children, the number of his wives! How many animals he killed, how many enemies he had. Primitive men had words for only three numbers—one, two and *many*. Gradually the “many” became sorted out—3, 4, 5, 10.

Suppose we had not yet invented numbers above 10. Suppose we were unable to deal with numbers higher than a million, or even a billion.

Come to think of it, how many people do know what a billion really means—or even a million? Counting as fast as you can it would take you three days, 24 hours a day, to count to a million—over eight years to count to a billion.

How big would a room be if it were a million times as big as the room you are sitting in? Would it be as big as the Empire State Building? As big as an Egyptian pyramid? As big as the Pacific Ocean? As the whole earth? You might amuse yourself by proving that a room with a million times the dimensions of this one would have a volume many times as large as the earth.

Is it any wonder that we find it difficult to realize what it means when we say that a modern hydrogen bomb has an explosive energy 20 million times as

great as a one-ton TNT bomb? That is a big bang indeed. But we should not be misled the other way either. For the radius of destruction of a bomb depends on about the cube root of its explosive energy. And that means a 20-megaton bomb has a radius of damage only the cube root of 20 million—270 times as big as for a one-ton bomb. That's still a damage radius of 10 miles or more. But a Los Angeles paper recently published a letter expressing fear that Los Angeles might be shaken by the Bikini tests—3,000 miles away!

Just the other day a science story in a weekly newsmagazine contained the statement that in a certain volume of air there were “billions of molecules.” Now of course that is perfectly true, but it is about as significant a statement as though we said that on the earth there live dozens of people. There are, of course, dozens of people on the earth, in fact, there are about a quarter of a billion dozen. Similarly, there are many billions of molecules in a cubic centimeter of air; in fact, there are 30 billion billion molecules. We feel sorry for primitive men who were unable to distinguish numbers higher than three. Some day in the future, people will think of 20th-century humans as being rather primitive because we were unable to think in terms larger than a billion.—Dr. Lee A. DuBridge, President, California Institute of Technology, in an address to the National Education Association.



Trolley Truck Goes Underground in Safe-Mining Operation

TAKING current through twin trolleys from a system of overhead wires, this electric truck hauls limestone from an underground quarry at Crestmore, Calif., without leaving a trail of deadly carbon monoxide. The first U.S.-made electric

rock-and-ore truck, it takes 16 cubic yards of stone on each trip to a crusher on the surface. Built-in safety devices include an automatic switch that shuts off power and prevents moving when the truck body is raised for dumping its big load.



**This Tree-House School
Gives Classrooms a Lift to Make
More Room for Playground**

WHAT looks like a flying box kite above is a new school built in crowded New Orleans. By lifting the structure on two rows of piers and providing a play area beneath it, Architect Charles



Engineer Perches on Synthetic Mountain to Test Carburetors

INSTEAD of heading for the hills, engineers test the high-altitude performance of Ford carburetors only a few

hundred feet above sea level. Vacuum-tight test chambers simulate the rare air of 10,000-foot-high mountain passes.



Colbert saved 28,000 square feet of land worth \$88,000. Supported by cantilevered trusses, the two wings of the all-welded building extend 37 feet beyond their concrete piers. Stairways rising

from a central entrance court (above right) lead up to 22 classrooms. A separate building, which houses offices, a clinic and a combination auditorium-cafeteria, is reached by covered walks.

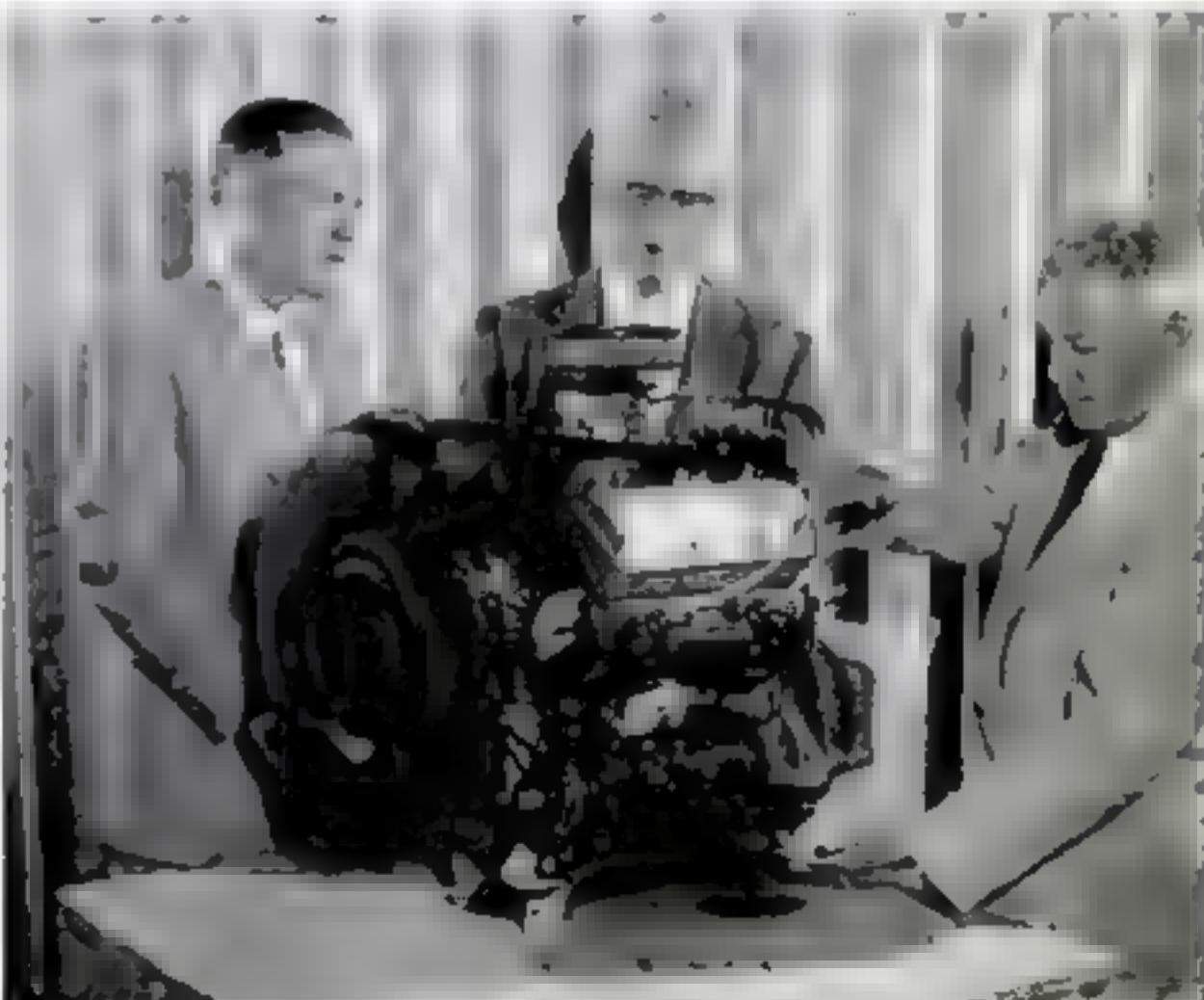
Mark II Wrapping Hides New Package

LITTLE face lifting, but engineering refinements show up in the '57 Continental Mark II. The car's weight is down from 4,825 to 4,797 pounds. A locking differential (optional) checks wheel spin and new power-steering control springs cut out "wheel fight" on bumps. The generator puts out 40 amps.



Radical V-4 Engine Is Power in a Capsule

THIS air-cooled V-4 weighs only 200 pounds, yet turns out 62 hp. Seventy pounds of aluminum went into the radical American Motors engine. About half the size of conventional engines, it can be used in airborne military vehicles, small private cars and trucks, or stationary pumps and generators.

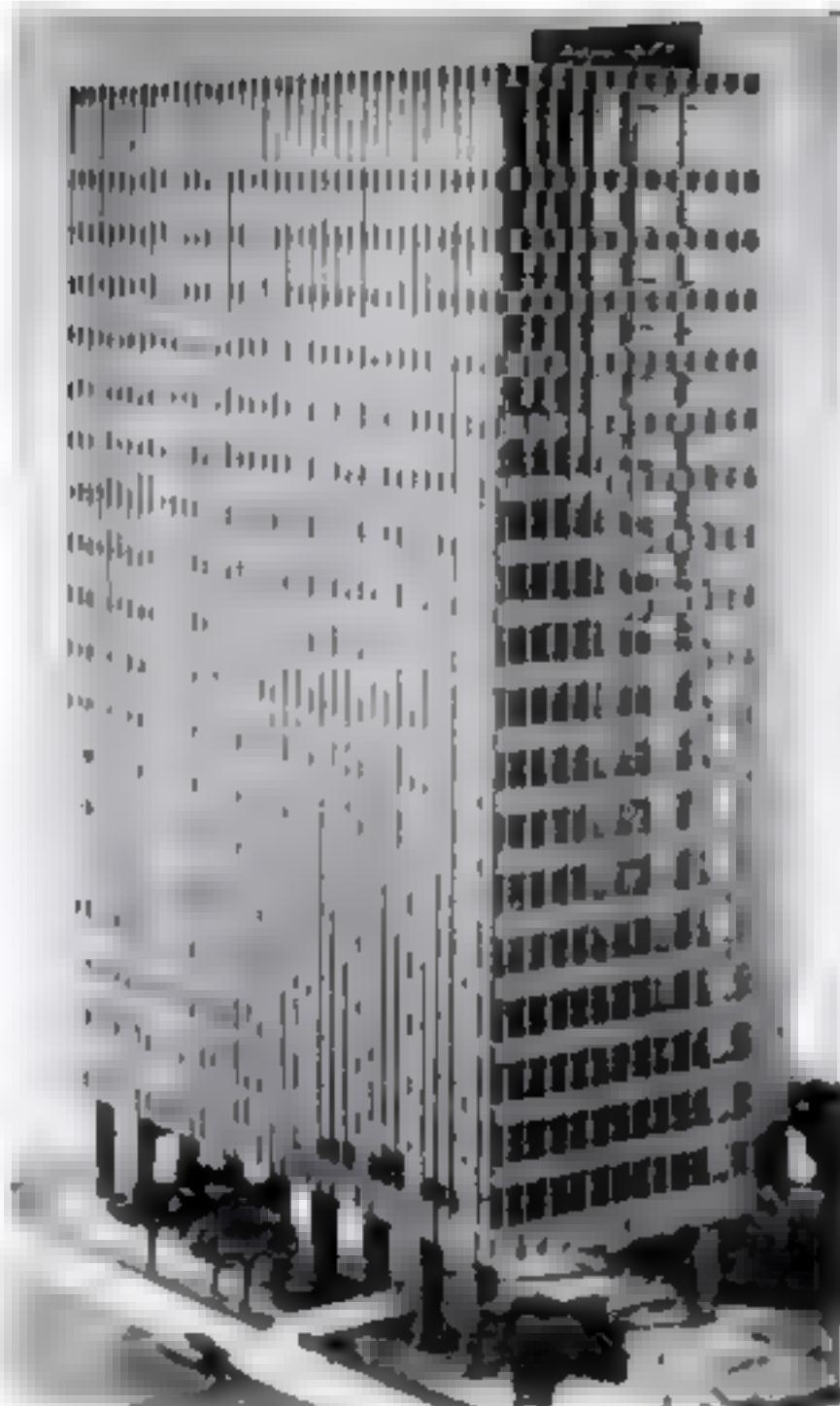




Magnetic Detective Polices Parts Moving Along Assembly Line

THIS workman is wiring cores for a new switch that checks metal parts riding on assembly lines. As each piece passes through a magnetic field, the robot detec-

tive trips a relay to move it on or, if there's a break in the parade of parts, shuts down operations. Minneapolis-Honeywell makes the switch. First use will be by Ford



Skyscraper "Floats" on Stilts

PILE drivers won't be needed when this San Francisco skyscraper goes up. Rising 20 stories high on stilts, it will "float" on an eight-foot-thick concrete mat set 30 feet below street level. Interior pillars are eliminated, too. The building will house the Crown Zellerbach paper company.



Parcels Ride in a Canvas Slide

INSTEAD of carting packages to the street, a Polish parcel service saves steps with the canvas chute above. Packages dumped into a wire cage on the third floor slide down into a waiting truck. Between loadings, the tube is drawn up by a rope attached to its lower end.



No-Post Wraparound Introduced on Italian-Made Chrysler Car

NEW idea in wraparounds was one of the marks of the "Norseman," a Chrysler experimental car which sank with the SS *Andrea Doria* last summer. Thin plastic,

grooved for windows, substituted for posts. The Ghia-built car had an up-curving roof and a powered rear window that would slide forward under the roof.

PICTURE NEWS



Bulletproof Decoy Keeps Its Head While Ducks Lose Theirs

SOME fellows in Wisconsin decided that the decoys used by duck hunters could stand some improvements. So they built a new kind of duck. As decoys go,

it is no ordinary, run-of-the-pond duck.

The ordinary decoy has lost its head when it's dug out of the attic in the fall. Or it's chipped. Or it lists to port when it's put in the water.

Not this duck.

This duck has been frozen solid in ice,

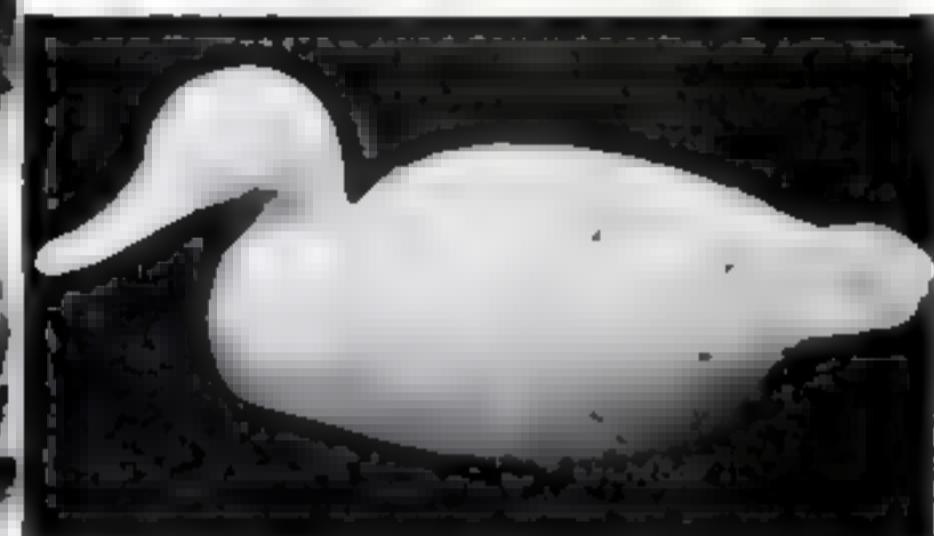


Cellar Ports Let Meter Men Peek

OWNERS of new homes in Cleveland and Chicago are finding strange portholes in their cellars. Not made for looking out, the glass peek holes let meter readers record gas and electric consumption without disturbing the occupants or having to return if they aren't home. The ports are standard structural-glass building blocks made by the Pittsburgh Corning Glass Co. More than a thousand of the peek-a-boo cellar ports have already been put in use.



FLEXIBLE PLASTIC DECOY takes a tough beating from the car wheel above, then springs back to shape unharmed. One below bristles like a pin cushion after 12-gauge shotgun blast from 30 feet, yet takes on no water because of the self-sealing action of the spongy plastic.



shot at, and run over by an automobile—all without harm to its ducky dignity.

The Wisconsin fellows, McBell Enterprises of Racine, make their decoys out of a special vinyl plastic with built-in color that can't chip off. They make them look like mallards, canvasbacks, and so

on. They also build some with their heads turned to one side, as though they were talking about whatever it is that ducks talk about.

All this is tough on the real ducks, but probably only goes to prove that people are smarter than ducks, after all.

Electronic Grocer Delivers the Eats

WITH this food vendor, the shopper inserts a large "key" (right), then presses buttons to select the items she wants. The key totals her purchases, which will be waiting for her at the check-out counter. This is one of two automatic systems to be installed in I.G.A. food stores this fall. In the other, food selections are marked on colored cards at home, inserted in electronic machines at the store, and out rolls the order on a conveyor.





Blow-Up Arches Support Big Windproof, Watertight Hut

ONE man with a blower that hooks to a car battery can puff up this British hut in three minutes. A framework rigid when air-filled, arcs nine feet high under rubberized fabric to form a structure 19

feet wide and 30 feet long. Plastic windows, zipper-closed doors and a detachable floor with outlets for lights and telephone turn the hut into a light and airy shelter, canteen or storage shed.

Extended Tail Fins Stabilize Low-Slung Plastic Turbine Racer

A TWIN TAILED ground skimmer, Renault's Shooting Star packs a gas-turbine engine amidships, behind its single bucket seat. Gulping air and spewing exhaust

through side ports, the kerosene-burning racer set a new record for gas turbines, taking a measured mile at Bonneville Salt Flats, Utah, at 191.2 mph.





New Fire Engines Souped-Up to Boost Horsepower and Torque

FIRE engines are taking corners and heading down straightaways with more horsepower under their hoods. Mack engineers have added zing to aerial pumper and ladder trucks by boosting their Thermodyne engines to 262 hp. and 615 pound

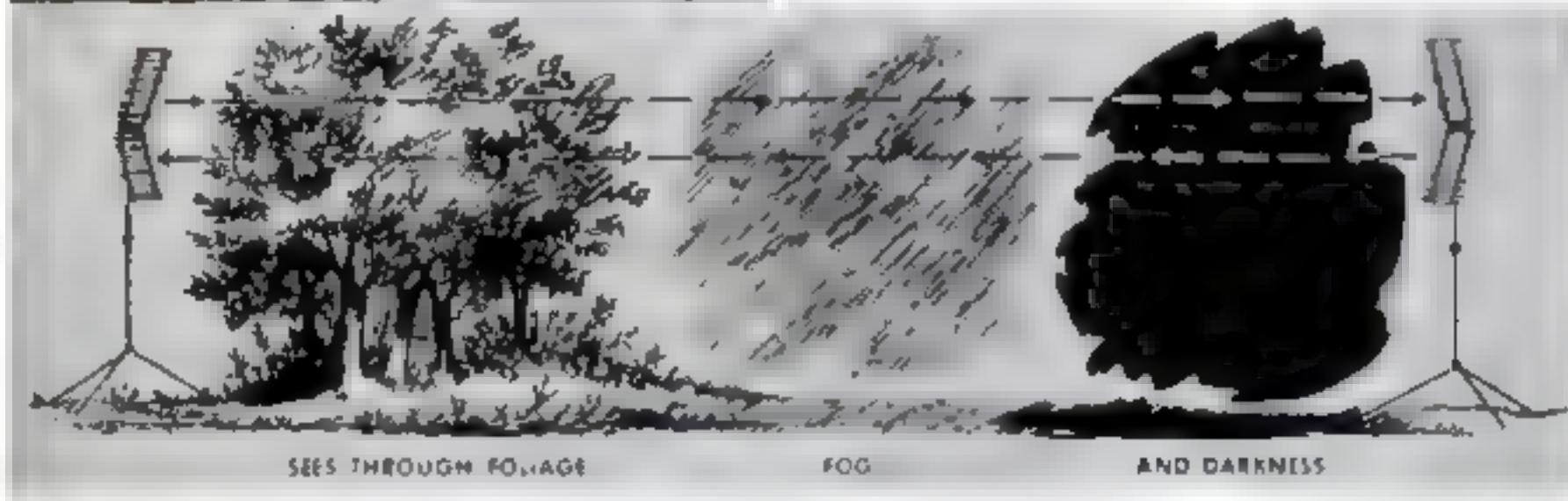
feet of torque, while holding displacement at 707 cubic inches. A freer-breathing engine delivers the power bonus. Intake and exhaust ports are on opposite sides, and the intake has been redesigned so that it is larger, more direct and cooler.



"Yardstick Radar" Measures Accurately as Far as 50 Miles

DISTANCES up to 50 miles can be measured accurately at night, through trees and in foggy weather with a new electronic setup developed by the U.S. Signal Corps. Artillery far behind the front can pinpoint friendly battlefield stations with it, and surveyors can use it over rough terrain and water.

The radar rig has two portable transceivers, each of which can be set up and run by one man. The 25-foot collapsible antennas play "catch," bouncing signals back and forth. Automatic computers register distances in terms of the time a signal takes for 10,000 round trips.



SEES THROUGH FOLIAGE

FOG

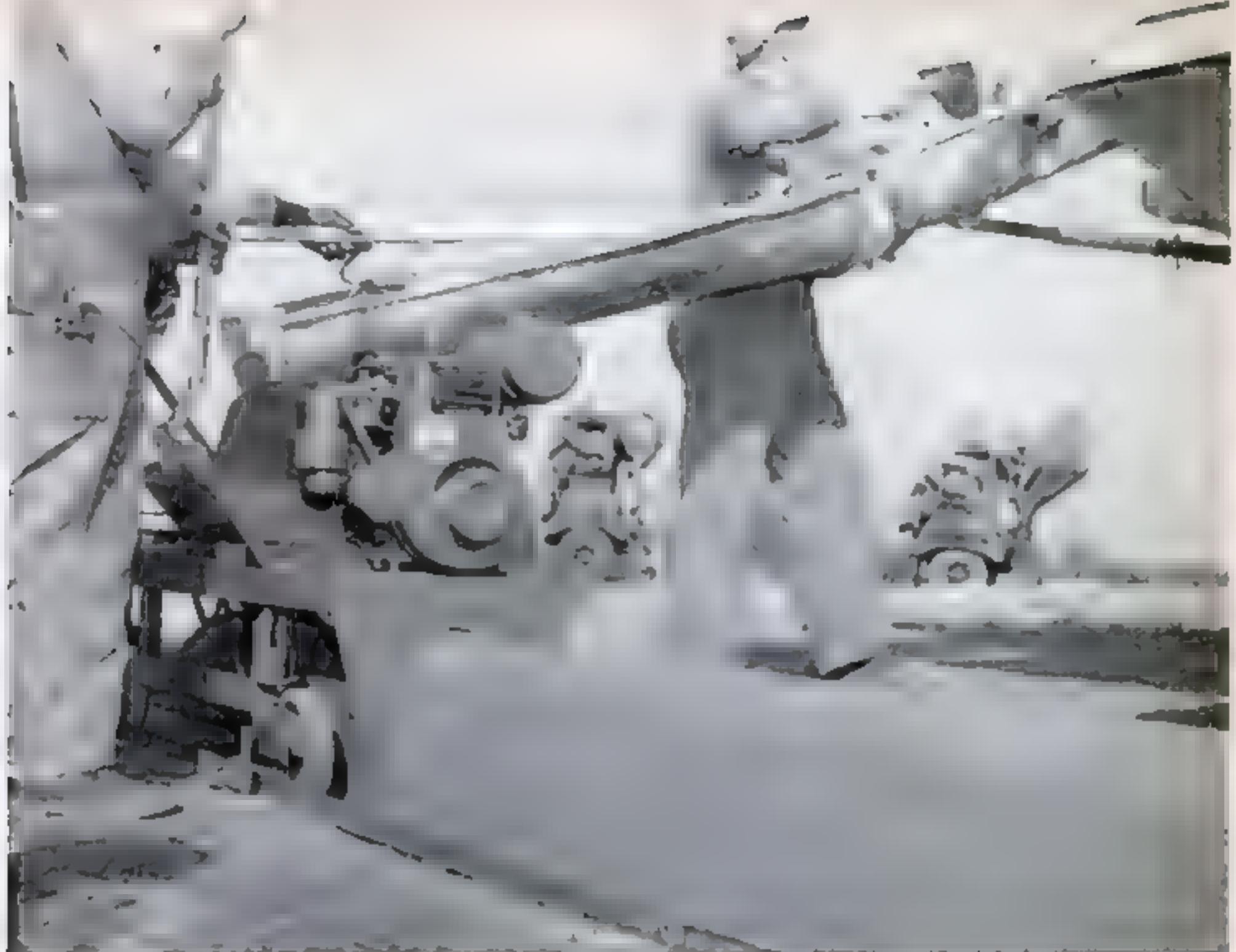
AND DARKNESS



Liquid Lens Coating Absorbs Stray Light to Pass Clearer Image

THE split photo of a model plane (above right) shows how a liquid developed by Northrop Aircraft absorbs unwanted light to improve sharpness. The

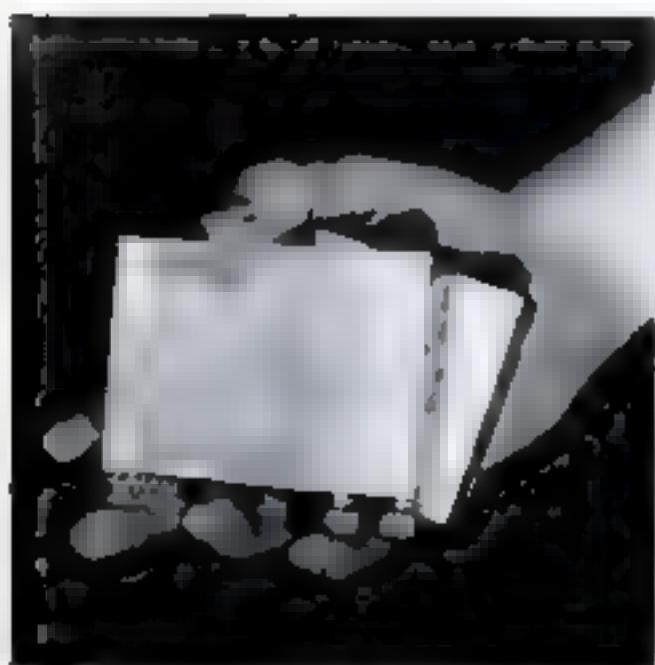
clear half of the picture was taken through the "Luxorb" coated prism in front of the camera (left), the fuzzy image through the uncoated prism next to it.



Automatic Machine Lays Eight Feet of Finished Curb a Minute

This machine leaves a trail of quick-drying concrete or asphalt road divider that needs no wood forms or hand finishing. It is self-propelled on an angle-

iron track. Concrete from its hopper is forced by a worm gear into the mold and applied to the roadway. A similar machine lays a curb complete with gutter



Two-Way FM Radio Set Fits Inside Soldier's Combat Helmet

A RIFLEMAN can now report in with battle information or receive orders with a two-way transistor FM set that weighs less than a pound. Talking into a thumb-

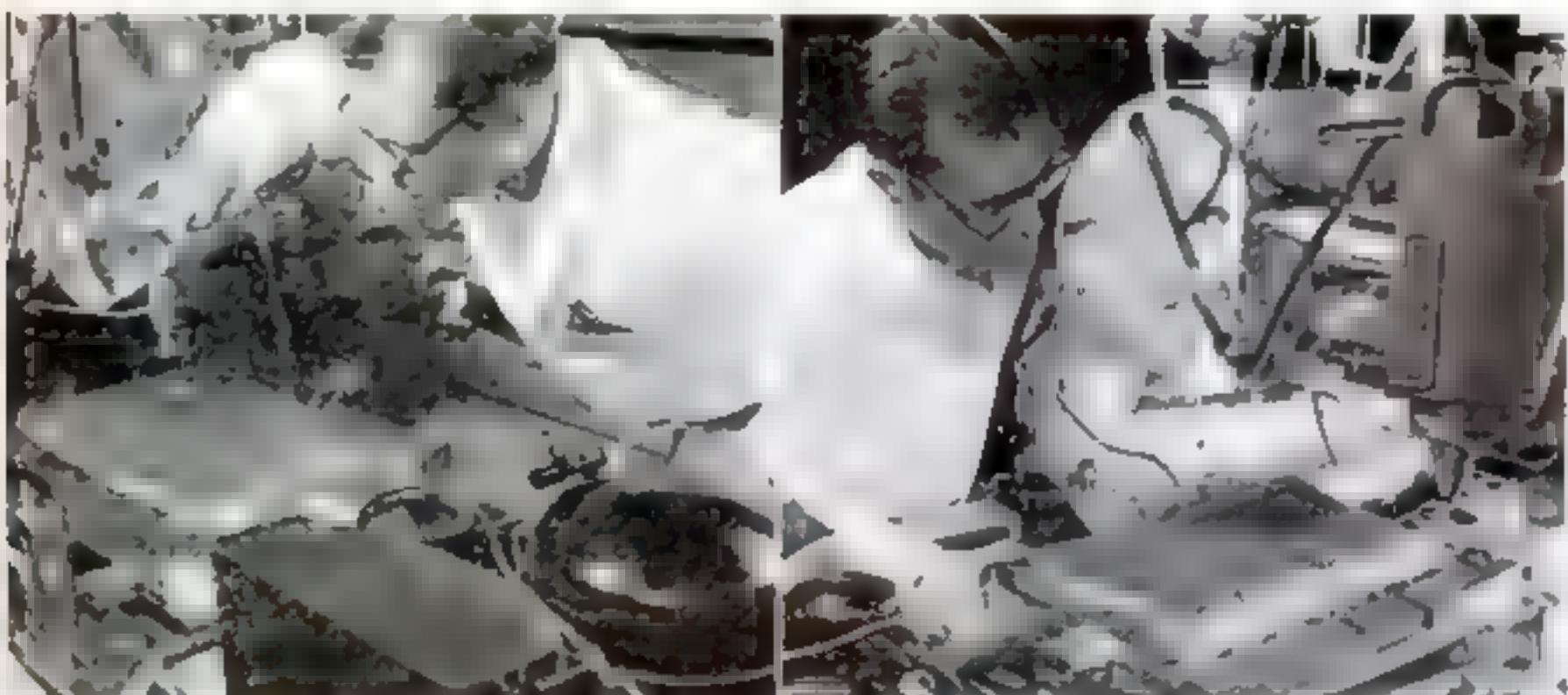
sized mike, he can reach buddies a mile away. The works fit into two cases, shown at left, which snap inside the soldier's specially made plastic helmet.



Hot Exhaust Cools Czech V-8 Mounted on Rolling Test Bed

TAIL jets cool the Tatra sedan V-8 engine being road tested on this Czech racing car. Twin exhaust pipes in the flared ejectors suck air past the two banks of

finned cylinders, saving power normally wasted to spin cooling fans. Burning alcohol, the rear mounted 150-cu.-in. unit puts out 200 hp at 7,000 r.p.m.



Honeycombed Metal Is Frozen into Ice Block for Machining

QUICK-FREEZE treatment makes it easier to machine honeycombed metal into guided missile parts at a Northrop plant. Water is poured between the tissue-thin

walls of blanks (left), and then frozen. The ice stiffens them so that the tiny slicing tool (right) shears through without crushing the walls of the cells.



Camera in Pilotless Helicopter Would Televise Battles

Robot helicopters, with a TV camera replacing the pilot, may become the battlefield reconnaissance eyes of the Army. This Kaman HTK-1 is being remote-con-

trolled by the man in the middle above, who has never piloted any aircraft. For safety, a pilot was aboard for the demonstration, but didn't touch the controls.

Robot Ramjet Tops Speed of Sound

How fast this Lockheed X-7 goes, the Air Force won't say, except that it "flashes through the stratosphere in level flight at speeds well beyond that of sound." Used as a test vehicle in the development of new ramjet engines, the X-7 is launched from a B-29 and boosted by rocket to ramjet speed.





Giant Muffler Subdues The Screaming of Jet Engines During Ground Run-Ups

B-36 Takes Atomic Reactor Up High for Test on Plane and Crew

THE first atomic furnace to fly—prelude to an atomic powered plane—is inside this modified B-36 distinguished by a blue nose and radiation symbol on

WHEN the four engines of a big Vickers Valiant jet bomber are run on the ground, they make a mighty noise. To quiet the roar, the British have developed this

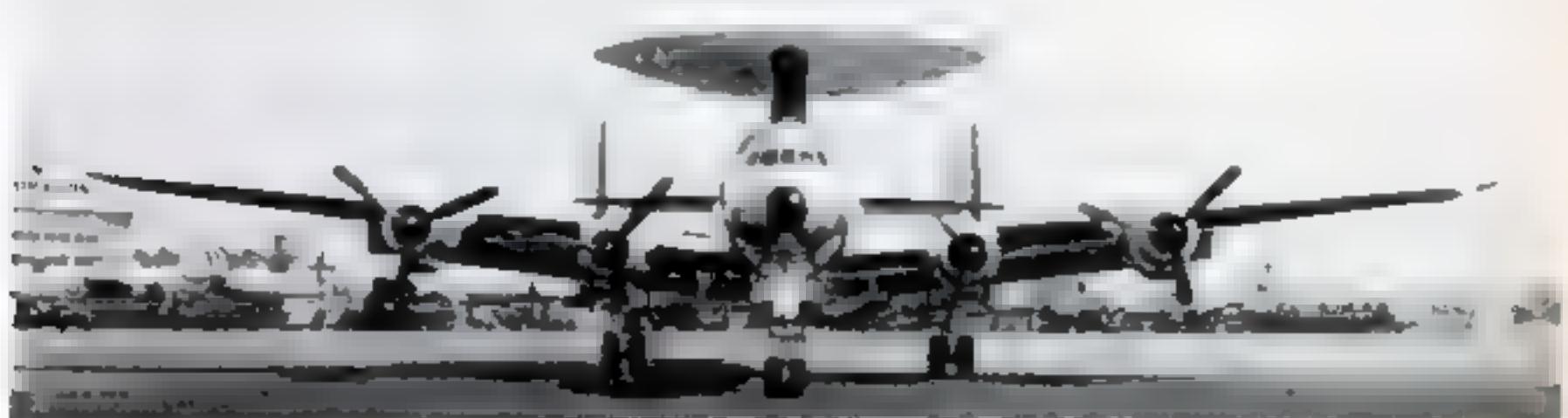
the tail. The furnace, which is turned on only high over unpopulated areas, does not propel the B-36, but helps test the effects of radiation on crew and plane





huge, mobile silencer which has twin mouths to swallow the noise of a pair of engines. The unit is mounted on a trailer fitted with hydraulic brakes to hold it

fast against the powerful jet thrust. Built-in jacks at the front end and a rear pivot make the silencer adjustable for various types of jet aircraft.



Saucer Riding Astride Navy Plane Makes It a Flying Radar Station

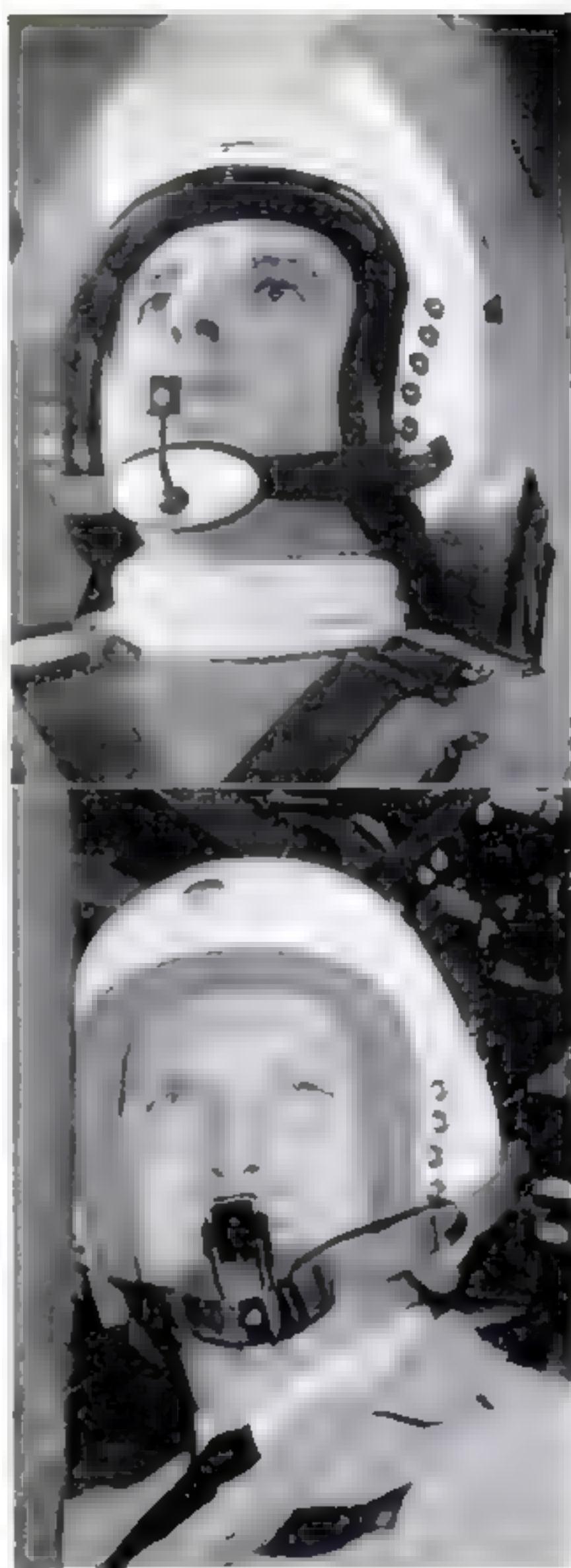
LIKE nothing seen before, this Navy WV-2 Super Constellation carries its own flying saucer. The 30-foot ellipsoid is a

radome housing an early-warning radar antenna. Lockheed engineers are now testing flight effects on the "parasite"



Jets Play Follow the Leader

STREAKING straight up, members of the Air Force "Thunderbirds" put four shiny, new F-100C Super Sabrejets through their paces. The white smoke trail is ejected so that spectators can follow the intricate maneuvers of the world's first supersonic aerobatic team.



Space Fiction Comes True

THE pilot's helmet and microphone in the top photo were designed for a Walt Disney TV movie about spaceship travel to the moon. The Navy liked the chin-clip mike so well that it ordered a slightly modified version, shown being worn by a Navy officer in the lower photo.

Busier than beavers, the electrons in a color TV set have to do a complex series of jobs with dazzling speed and precision. Here is how their dance brings you the big show.



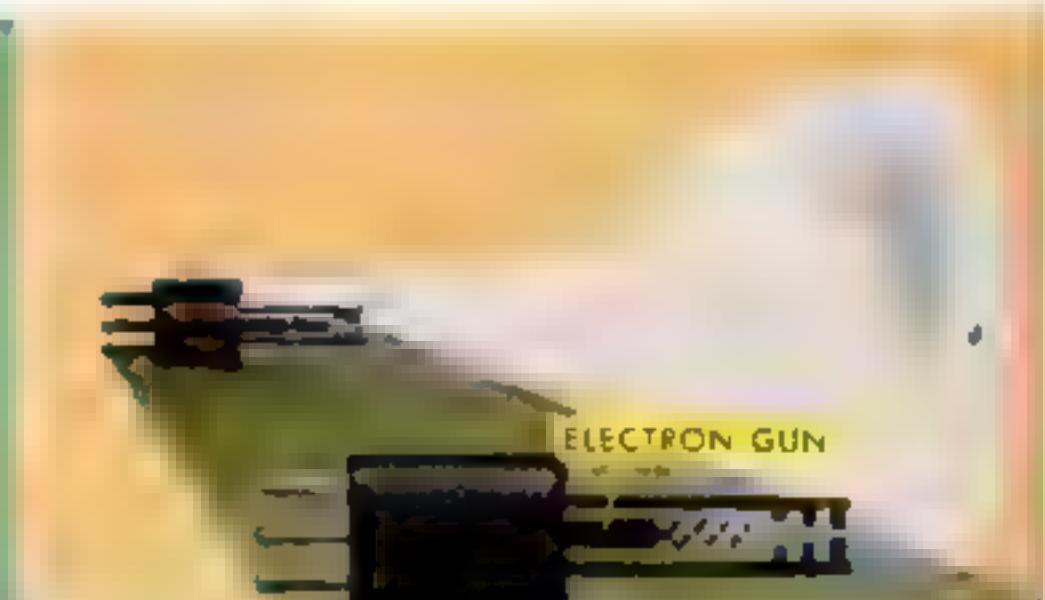
How color television works

WITH the cost of color TV sets creeping downward, this may well be the season when full color entertainment really takes over U.S. living rooms. One manufacturer (RCA) already is offering a color receiver for less than \$500. Color programs are on the increase, with many more scheduled for next year. Manufacturers who held back are now gearing their plans to include full-scale color-set production.

If you're a black-and-white TV owner and viewer (as 90 percent are), you've

probably wondered why color TV has taken so long to arrive. As the picture story on this and the two following pages shows, color TV is a complex affair, needing complicated cameras, transmitters, receivers, and picture tubes.

In effect, a color TV receiver has to do three times the job of a black-and-white set. It must make up pictures, not just of lights and darks, but of the three primary colors of transmitted light—red, green, and blue. And do it at enormous speed and with high precision.



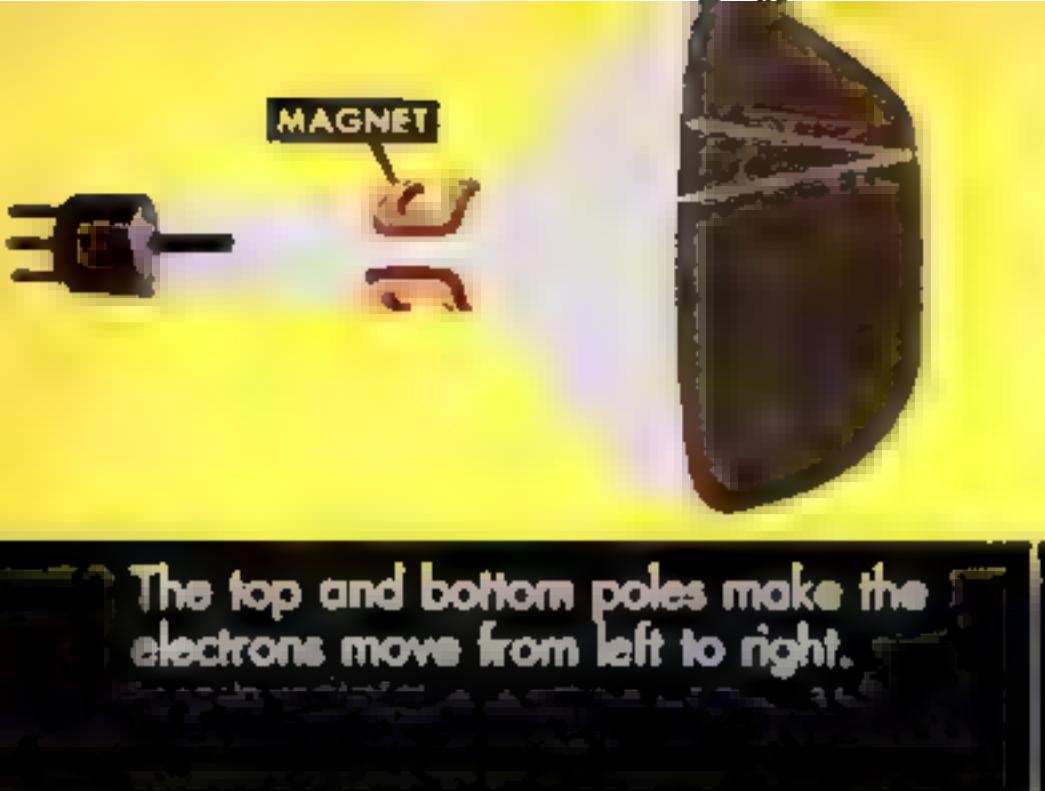
1 A BLACK-AND-WHITE TV TUBE has a "screen" of a phosphorescent material or "phosphor." Like the coating in a fluorescent lamp, the phosphor glows white when it is hit by electrons.

1 A BLACK-AND-WHITE TV TUBE has a "screen" of a phosphorescent material or "phosphor." Like the coating in a fluorescent lamp, the phosphor glows white when it is hit by electrons.

Drawings for this article originally appeared in a Pictorial Science Classroom Filmstrip, "How Color Television Works." This strip is now distributed by the McGraw-Hill Book Co., Inc., Text Film Dept., 330 W. 42nd St., New York City 36.

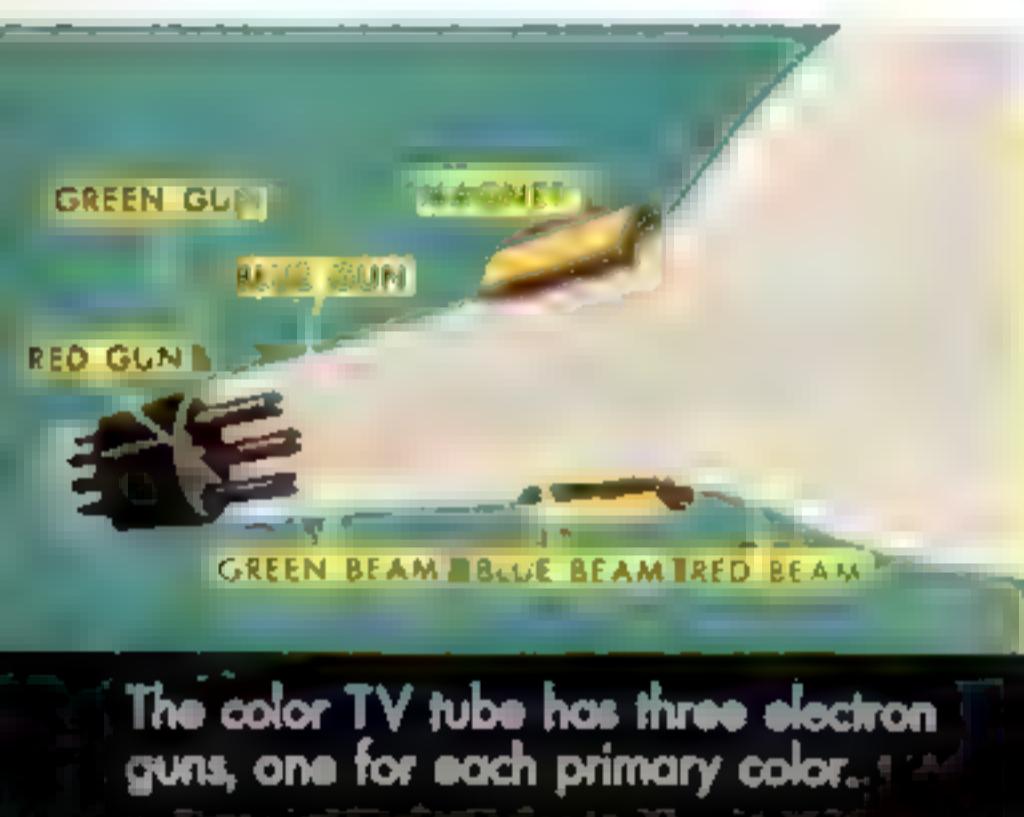
2 BEAM OF ELECTRONS, produced by the electron gun in the neck of the tube, is shot at the phosphorescent screen. Wherever the beam hits the surface, the phosphor coating glows.

2 BEAM OF ELECTRONS, produced by the electron gun in the neck of the tube, is shot at the phosphorescent screen. Wherever the beam hits the surface, the phosphor coating glows.



2 The top and bottom poles make the electrons move from left to right.

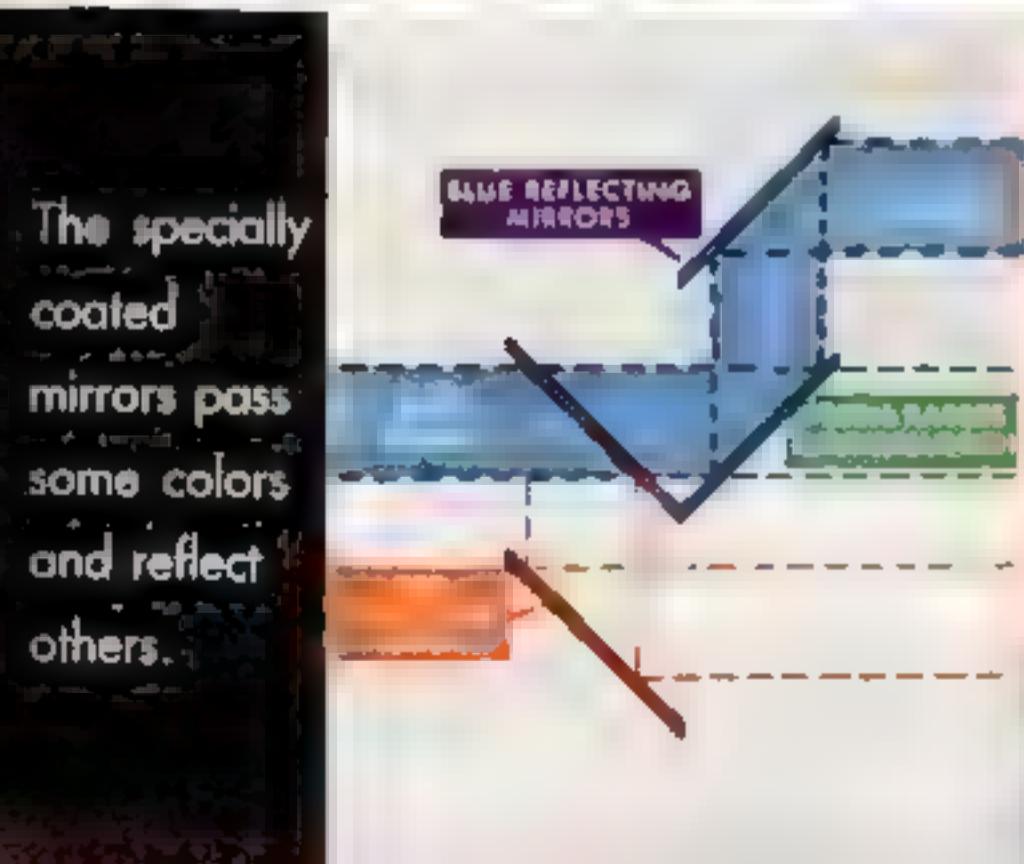
3 **TWO MAGNETIC FIELDS** are used to move the electron beam back and forth and up and down. A vertical magnetic field above moves the beam back and forth horizontally.



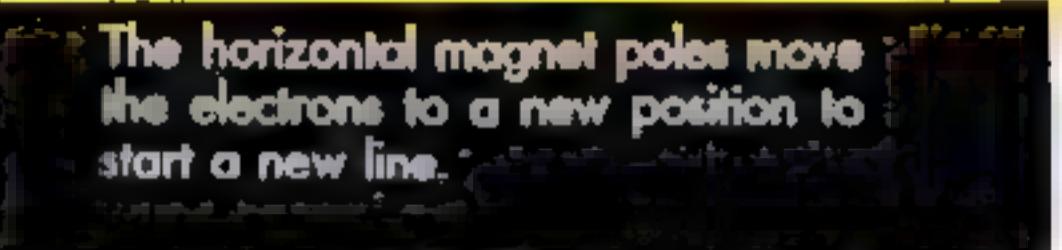
5 The color TV tube has three electron guns, one for each primary color.

7 **THREE ELECTRON GUNS** are built into the neck of a color television tube. Each gun is controlled by one of three color signals and produces a separate beam of electrons.

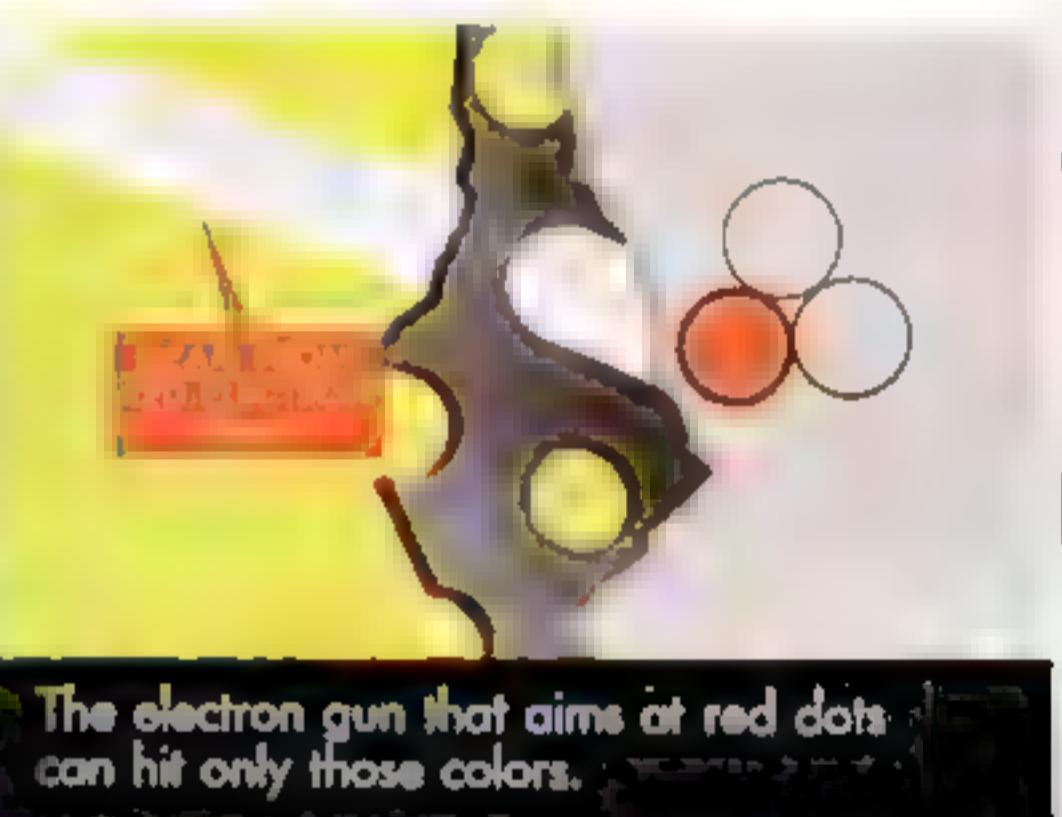
11 **MIRRORS IN OPTICAL SYSTEM** have a special coating that reflects some colors and allows others to pass through. This produces three light paths, red, green, and blue.



The specially coated mirrors pass some colors and reflect others.



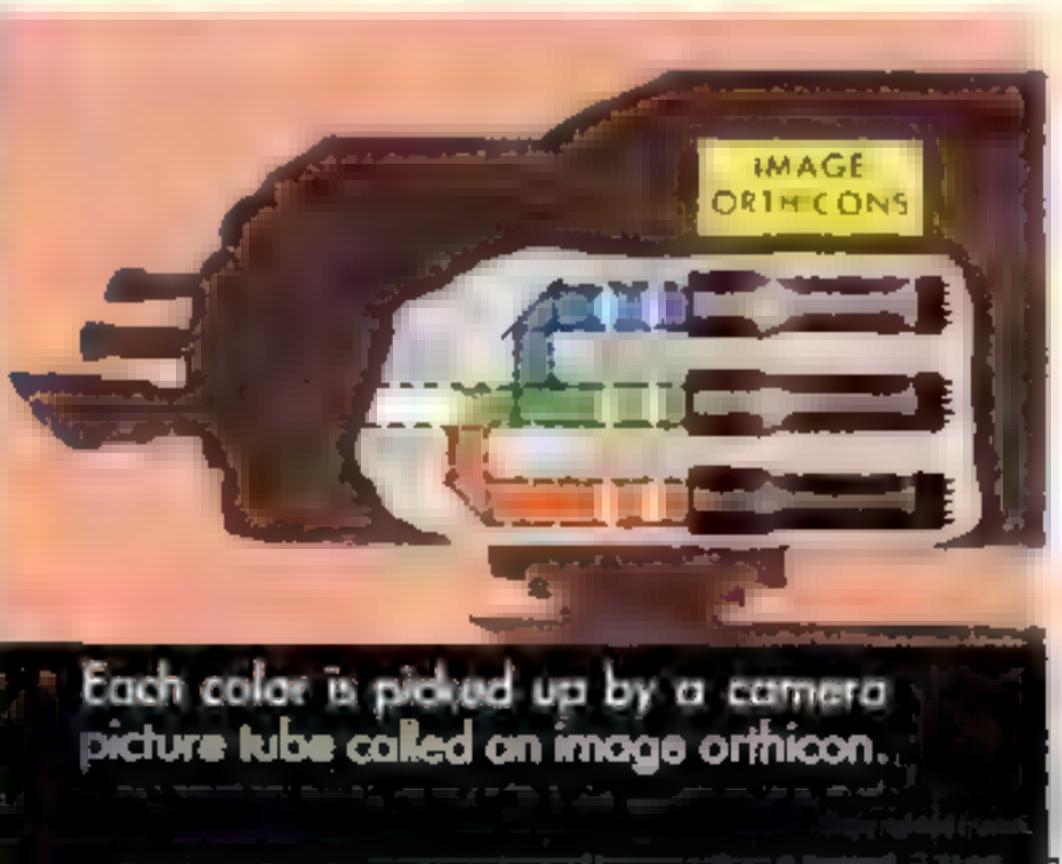
4 **HORIZONTAL MAGNETIC FIELD** moves the electron beam up and down. Combined, the two fields cause the beam to scan the face of the tube with a series of horizontal lines.



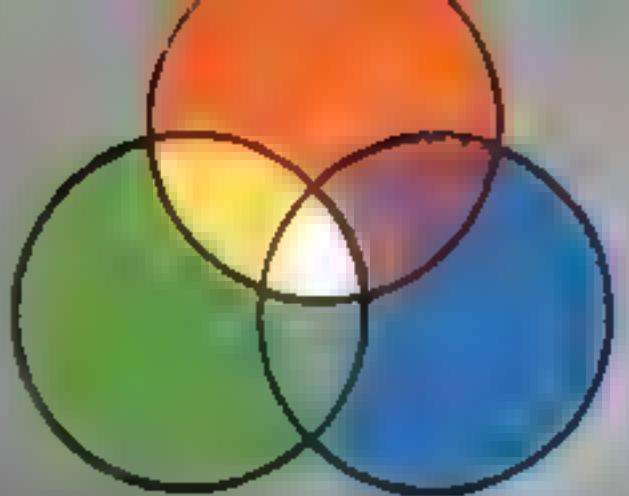
6 The electron gun that aims at red dots can hit only those colors.

8 **MICROSCOPIC HOLES** in mask behind tube's screen are so arranged that the red beam hits only red-glowing dots, blue beam hits only blue dots, green beam only green dots.

12 **EACH LIGHT PATH** is focused on one of three separate camera tubes. One tube picks up the red image, the second tube the green image, and the third tube the blue image.



13 Each color is picked up by a camera picture tube called an image orthicon.



4 The three colors form white. Different amounts of each color form all the other colors.



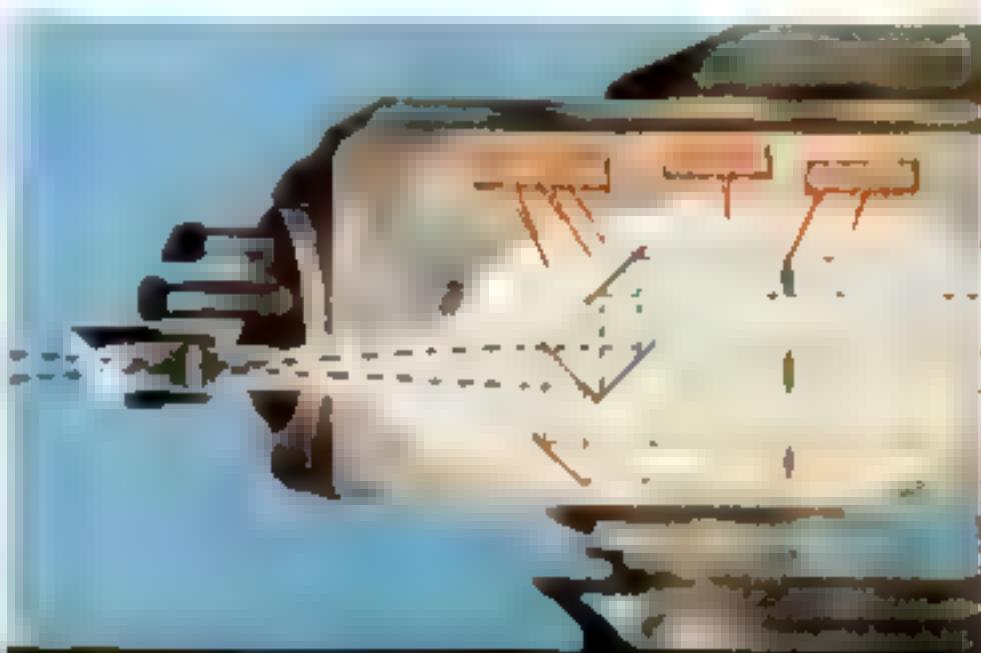
5 The three colors are arranged in groups of phosphor dots, one for each primary color.

5 COLOR TELEVISION makes use of the fact that all colors including white can be produced by mixing in varying amounts the three primary colors for transmitted light.



7 If one color is stronger, the yellow will appear greenish. All shades result from the different brightness of each color.

6 A COLOR PICTURE TUBE has a coating made up of three phosphors that glow in color: one red, one green, one blue. These are arranged in groups of three on the face of the tube.



8 The light is broken up into the three primary TV colors: red, blue and green.

9 GLOWING COLORED DOTS on the screen, too tiny to be seen by the human eye, fuse and blend together, like the dots in these color engravings, to produce the right color.

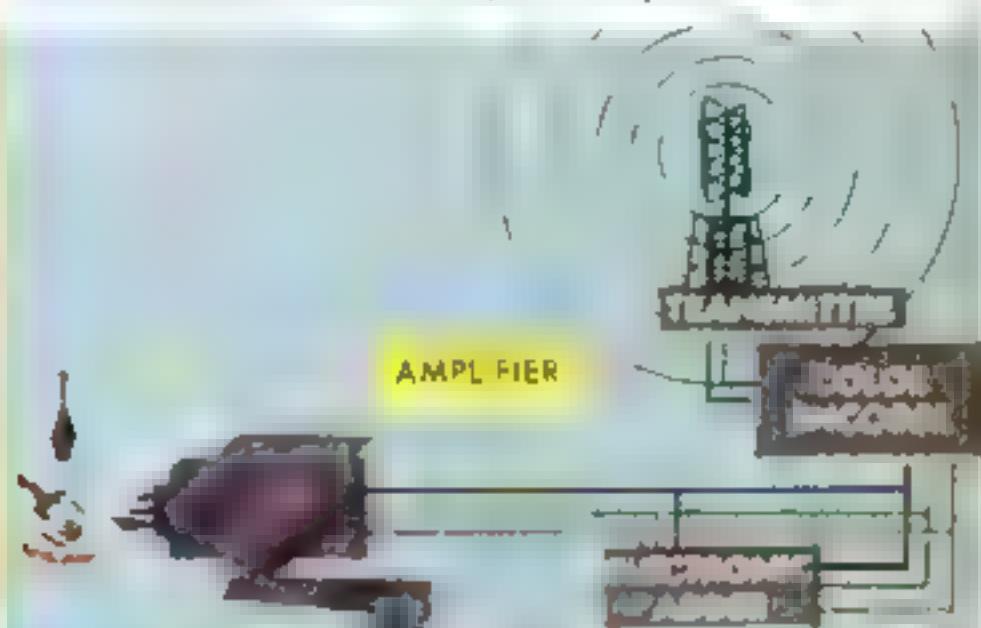
10 STUDIO CAMERA has an involved optical system made up of mirrors, lenses, and filters to break down the colors in the scene being televised into the primary colors.

13 CAMERA TUBES SCAN IMAGES with electron beams to produce color signals. The "red" tube produces "red" signal, the "green" tube green signal, the blue tube blue signal.

14 COLOR CAMERA feeds three signals to a color encoder. This combines the signals to produce complex color information signals for transmission. Sound signal is separate.



11 Each camera tube scans only the color it receives. The colored light changes to electrons in the tube.



12 Each color is a separate signal. Sound signals go along as FM signals.

What Grade of Gas

By Harland Manchester



Pay your money, take your choice: This new pump can squirt any one of five grades of fuel.

Does Your Car Need?

You're wasting money, say experts, when you feed your car a richer diet than it needs. Here's what you should know about octanes—now, and for your next car.

THE beach-tanned citizen in the brand-new convertible pulled up at Glenn and Frank's service station at the corner of Washington and Main in Orlando, Fla. "Fill her up," he said, then took a second look at the Blue Sunoco pump. "Say, what is this?" he said.

"This is our new octane-selector pump," explained Frank Schaeffer. "This one pump dispenses five different grades of gasoline. You set this dial here and get whatever octane rating you want, according to the needs of your car."

"I don't know what my car needs," said the man in the convertible, "but it seems to me I'm getting a little too much ping."

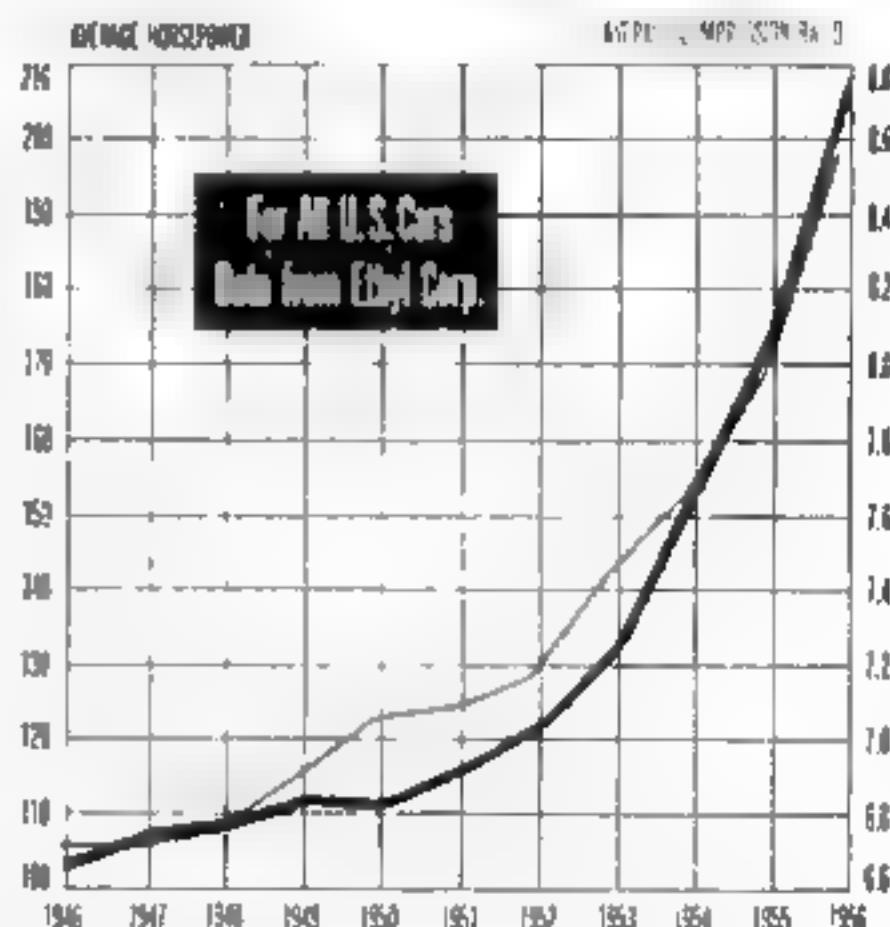
"That's possible," said Frank. "That engine has a 9.5:1 compression ratio—which calls for high octanes. Why don't you try the '230' and see how that works? If that stops the knock, you can cut down to 220, then to 210, and stick to the lowest grade that will give you top performance."

If this new gamble by the Sun Oil Company, and an equally interesting bet recently laid down by the Esso Standard Oil Company with its "Golden Esso Extra," prove to be well-advised, drivers all over the country will soon be asking the same questions as the man in the convertible.

New octane levels. Sun and Esso have noted that the motors of a few '56 cars have such high compression ratios that they are knocking excessively even on conventional premium fuels—which late this spring hit a national average of 96.7 octane numbers—the highest in motoring history.

The new super-fuels are designed for engines with compression ratios of 9:1 or better. Already the list of such engines includes the '56 models of Cadillac, Olds, Packard,

Compression, Horsepower: Up



As auto makers turn out increasingly souped-up super-cars, refiners anxiously eye charts like this. Says a top auto executive: "There is no engineering limit for compression ratios." Detroit can build them—but can refiners fuel them?

Esso's Solution: Third Pump



One answer to the hunger pangs of new high-compression cars is Esso's Golden Extra, a super-super fuel to be sold in addition to regular and premium fuels. The third pump, now being installed in Esso's 18-state market, will take care of fuel needs to 1961, the company hopes.

the three Buick series, the Hudson Hornet V-8 and the Nash Ambassador V-8. One Packard is up to 10:1.

With an ear cocked toward Detroit, Sun and Esso predict still higher compression ratios, still further advances in horsepower, and finicky appetites for super-super fuels by more and more cars. If they are right, we are entering upon a period, to last five years at least, with a wide and puzzling spread between the fuel requirements of the hottest new cars and the oldest ones on the road.

"Cars are like people." Millions of drivers will face a dilemma as they roll up to stations where three to five grades of gas are sold. It would be fine if the octane requirement of each engine could be stamped on the flank by the manufacturer, but this is impossible. Cars are like people. No two cars are created exactly alike, and their needs change throughout their lives.

To begin with, cars coming off the same assembly line only a few minutes apart may vary widely in their fuel needs. Raymond I. Potter of Ford's Engineering Research Department reports that a test of 14 supposedly identical Ford V-8 engines showed that their octane requirements varied from 80 to 88. This variation is normal throughout the automobile industry.

Changing appetites. And this is only the beginning. The octane requirements of all engines increase sharply during the first 3,000 to 6,000 miles of operation. This happens because engine deposits slightly reduce the volume of the combustion chamber, thereby actually increasing the effective compression ratio, and because of a chemical effect that may cause pre-ignition. But cars of the same make and the same year do not always increase their octane appetites *at the same rate*.

The Coordinating Research Council (sponsored by the Society of Automotive Engineers and the American Petroleum Institute) has road-tested many new cars of many makes during this initial period. They have found that after the first few thousand miles, when cars are said to have arrived at their "Octane Requirement Equilibrium," there is a new set of variations in cars of the same make and year, showing a spread of 9 to 13 octane numbers in the fuel required to make them happy.

Even after your car has gone through its growing pains and has apparently decided what kind of fuel it wants, its

appetite can change as rapidly, and often as mysteriously, as that of a teen-ager. Suppose you buy a new car in the fall and use it throughout the winter for local stop-and-go driving. This is the kind of driving most likely to cause engine deposits and increase its octane requirement. Spring comes and you hit the open road. You clock up some fast mileage and the heat flakes off a lot of the carbon, reducing the octane requirement built up during the winter.

Local fuels for local needs. There are more variables. If you start at your sea-level home and drive to Denver, which is a mile high, there will be a decrease of about 10 points in your octane requirement at that altitude. You probably will not notice this, because local fuels are tailored to local needs, but engineers of the Standard Oil Company of Ohio and the Ethyl Corporation have determined by controlled road tests that the octane needs of your engine fall off about two points with every thousand feet of altitude.

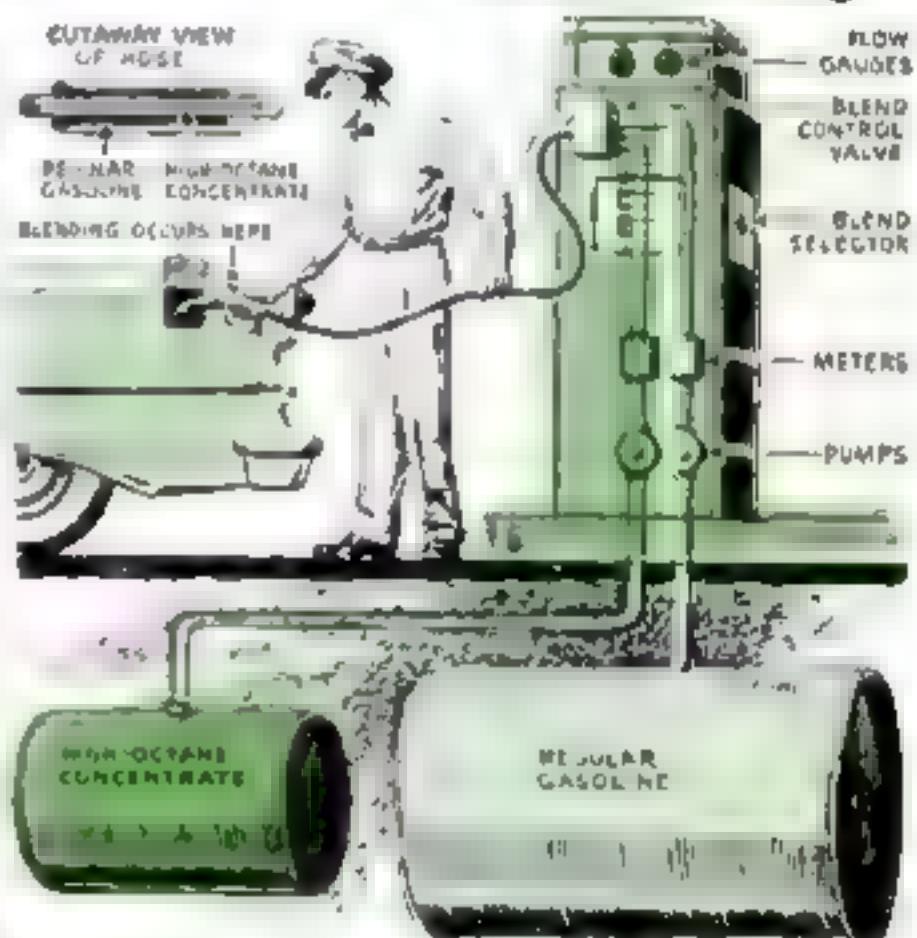
Other tests by the same team show that temperature, humidity and wind velocity all have an effect on your engine's appetite. By mixing up several weather factors they found that they could change the requirement of the average engine by 8.5 octane numbers. One of the test engines shifted 15 points.

Buying by ear. As a result, it is impossible for any driver, unless he turns his car into a laboratory, to determine precisely what kind of fuel he needs. He can only use his ears. If his car appears to knock excessively, he should first of all give it a checkup. A bad thermostat, a plugged radiator, a faulty water pump or a loose fan belt can raise engine temperature and cause knock. Too lean a fuel mixture or an over-advanced spark also promote knocking. If the knock continues, he can try a higher-octane fuel and see what happens.

If his car does not knock on regular fuel he will be wasting his money by buying premium, if his hot new car purrs nicely on conventional premium, any advantage he gets from the new super-fuels will be purely psychological. For higher-octane gas is not "better gas" unless your engine is built to use it.

Answer to ping and prayer. Yet a few intelligent drivers of new high-horsepower, high-compression cars seem to have found the answer to their prayers in the new super-fuels. Their engines knock, they try a super-fuel and the

Sun's Solution: Custom Blending



New pumps that blend a high-octane concentrate with regular gas, at the nozzle, give the customer his choice of five grades. By increasing octanes of either component, Sun could upgrade its blend for future higher needs.

Wanted: a new scale to rate "super-perfect" fuels

MODERN gasolines are running off the official octane scale. When octane standards were first devised, 100 octane stood for 2,2,4 trimethyl pentane, a rare laboratory-perfected fuel then considered to be the ultimate in knock-free behavior.

When fuels that outperformed 100 octane were produced for aircraft, the aviation industry set up a "performance" scale. Ratings are given in percentages above 100. For example, a

114 performance-number fuel gives 14 percent more knock-free power than 100 octane.

This system is not technically satisfactory for automotive fuels, so experts are now working out a new way to rate the super-fuels. The best guess right now is that the new "reference-fuel," with a rating of 120.3 octane numbers, will be a mixture of pure iso-octane (one gallon) blended with tetraethyl lead (six cc.).

knock is gone, which is what the book says ought to happen.

The "custom-blending" pump is now installed at 350 Sunoco stations throughout Florida. Developed by engineers of the Sun Oil Company and the Wayne Pump Company of Salisbury, Md., the ingenious new device dispenses any one of five grades of fuel at the flick of a dial. Beneath the pump are two separate underground storage tanks, one containing Sun's regular Blue Sunoco 200, the other a concentrate made by blending super-high-octane hydrocarbon stocks and adding tetraethyl lead. There are five numbers on the selector dial: 200 (Sun's standard grade), 210, 220, 230 and 250, each number representing a higher-octane fuel.

The setting of the dial hand determines the mixture obtained. Inside the gasoline hose there is another hose carrying the concentrate, and the blending takes place at the nozzle. The dial setting also adjusts the "price clock" so that the correct sales price is rung up for each fuel.

On tap: 105 octanes. Sun has not revealed the octane numbers of the four super-fuels, but reliable reports indicate that the three lower numbers represent a jump from the regular 94 to about 98, and that the 250 grade runs to an approximate 105 octanes or better. Flow gauges composed of two revolving pinwheels are set in the top of the pump, and the pro-

portion of regular fuel to concentrate being delivered is shown by their comparative speed. When the pump is delivering the 100-plus fuel, the concentrate's pinwheel is running as fast or faster than the other.

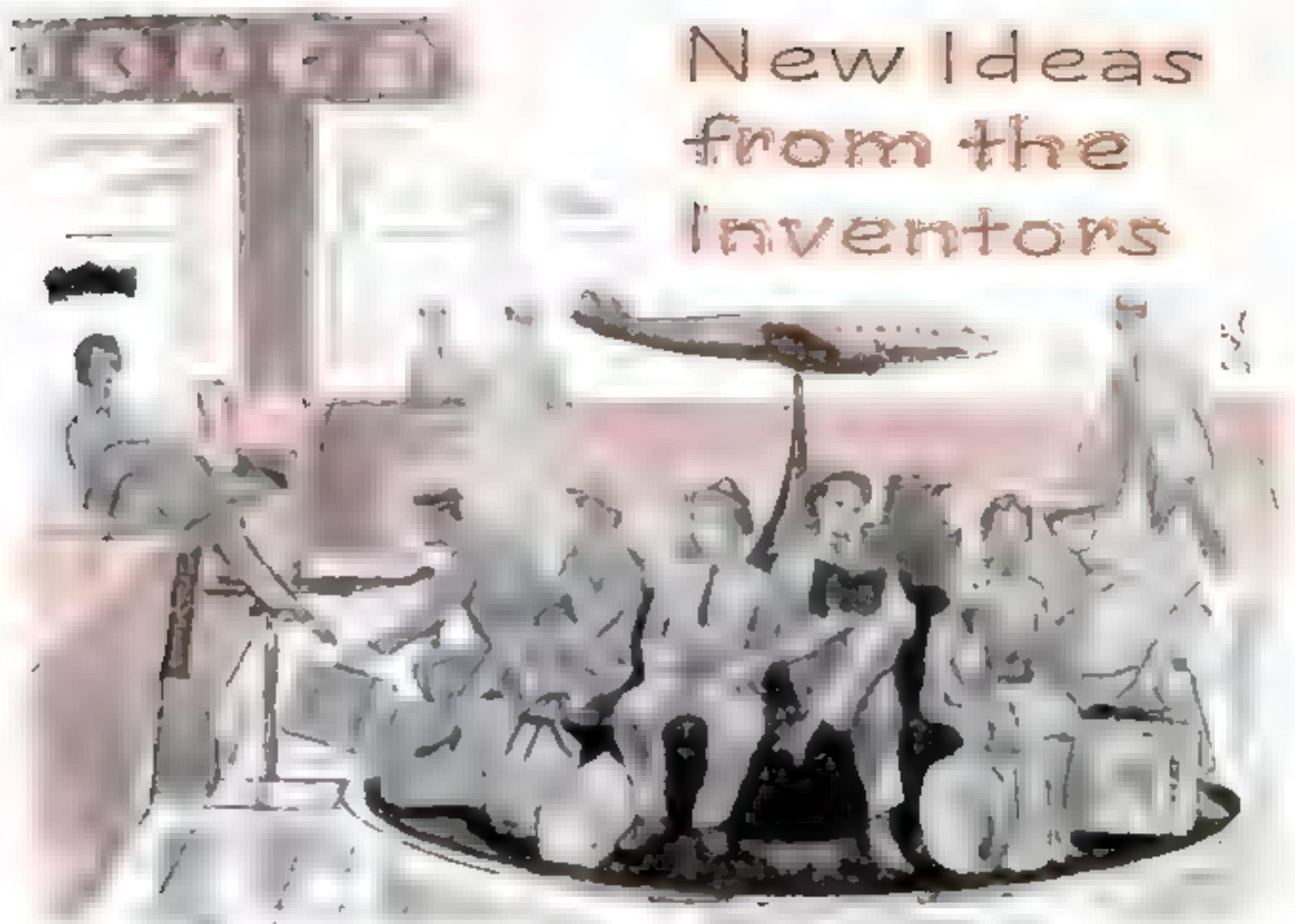
Compression vs. octanes. The race between compression ratios and the octanes to match them has been running roughly neck and neck ever since 1924 when Chrysler brought out the Redhead engine and suitable gasoline was temporarily scarce. When compression ratios edge ahead, cars knock; when octane numbers take the lead, no harm is done except that drivers waste their money on fuels their motors cannot benefit by.

The horsepower race is largely responsible for the big recent increase in compression ratios and the consequent appetite of new cars for hotter fuels. The average horsepower of the various makes has increased from 115 at the end of the war to 206.8 in 1958, with a jump of 33.7 in the last year alone. The chief way to get more power from an engine without making it bigger is to increase compression. Cars have gone from an average of 6.75:1 just after the war to this year's average of 8.5:1.

To boost all premium fuel to the level needed by the hottest cars, Sun points out, would be wasteful. So why not offer a variety—so owners of older cars won't

[Continued on page 217]

New Ideas from the Inventors



1 Turntable to Keep Line Moving. You wouldn't have to stand in line while waiting your turn, say, at an airport baggage-check counter, if the terminal

had moving seats like these. You'd simply take the first vacant space, then relax until the conveyor carried you—and your baggage—to the proper flight gate.

2 Dipstick to Show True Level. You could tell at a glance whether this dipstick had been inserted to its full depth, because pressure on the sliding spring collar would extend the rod. Upon reinsertion, a pawl would shorten the stick, readying it for the next check.

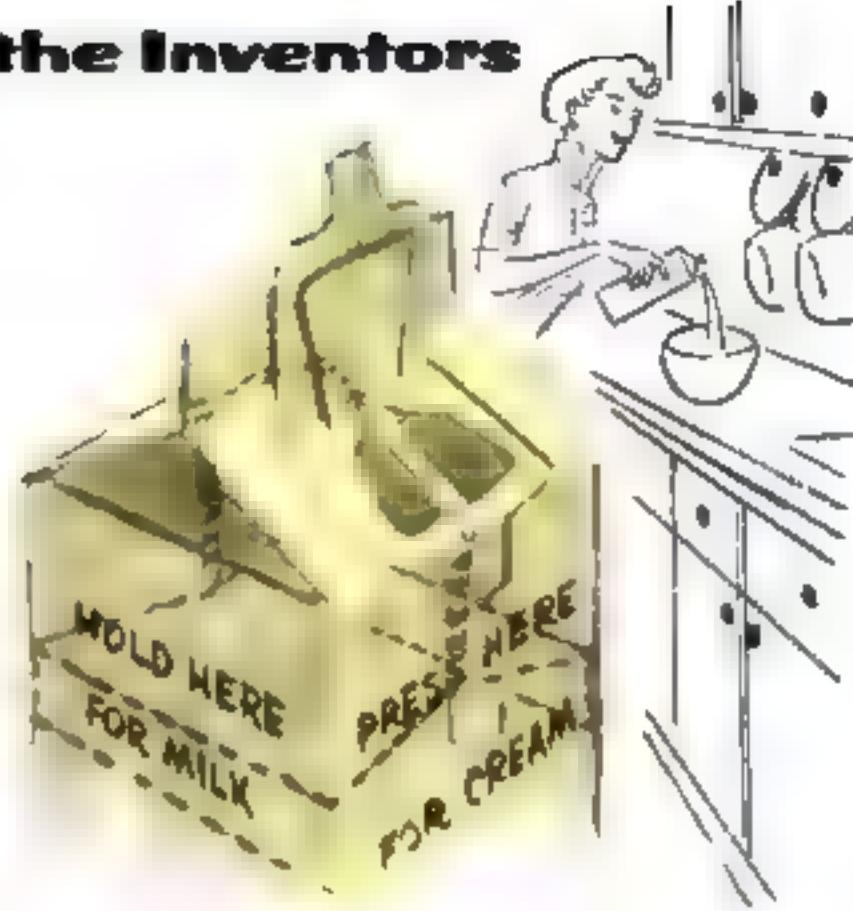
3 Pen to Adjust Point Width. Turning a sleeve on this pen would vary the thickness of its point. The nib-spread adjustment would give you a quick choice of normal-weight lines, heavy ones for emphasis, or very fine lines for squeezing some extra words onto a page.



More New Ideas from the Inventors



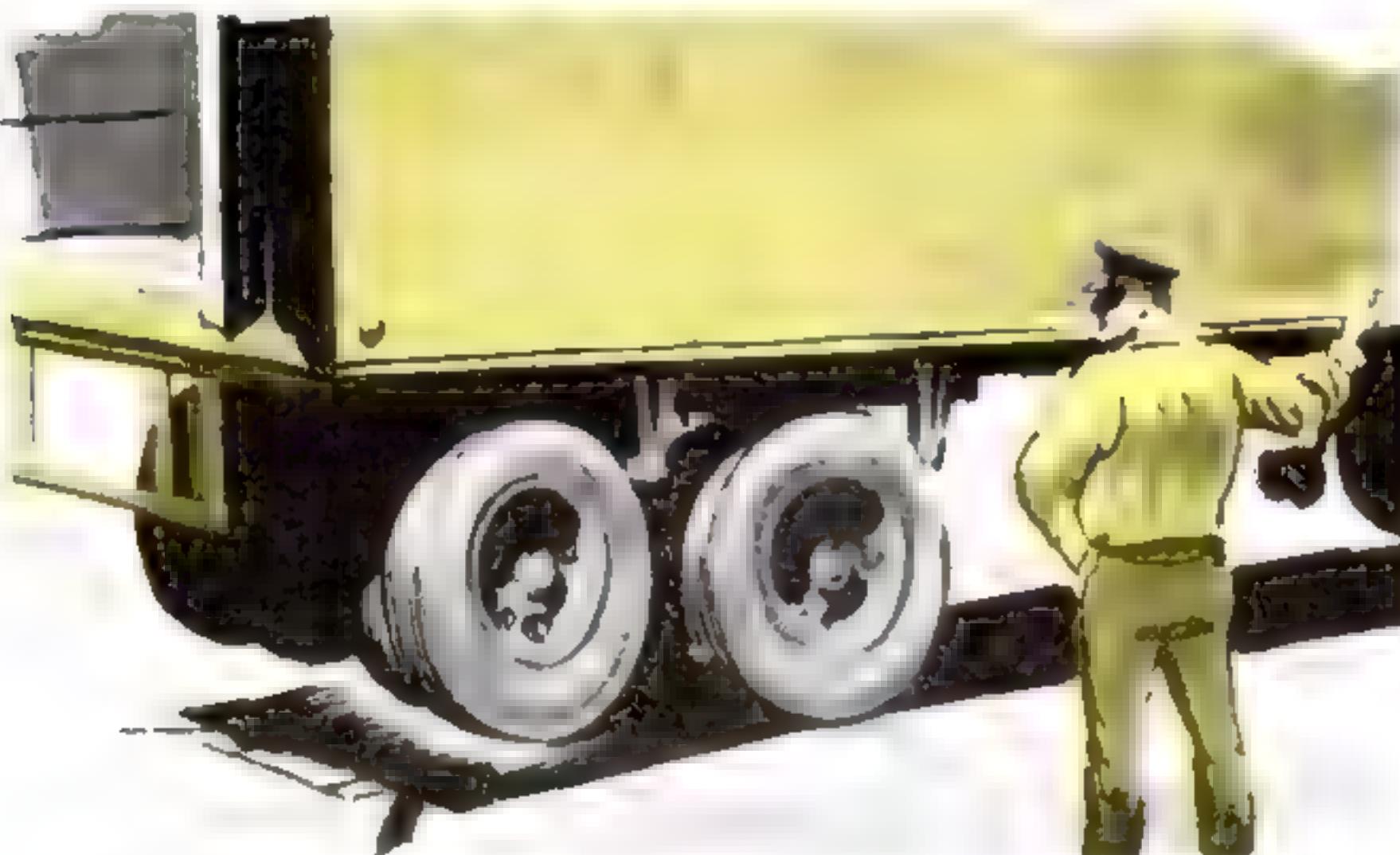
4 Speaker to Check Your Speed. With this speedometer-driven alarm on the job, you couldn't exceed a speed limit without knowing it. You could "dial" your own limit, but if you broke it the speaker would sound. The device would operate independently of the car radio.



5 Milk Carton to Separate Cream. Cream rising in this container would flow into a trap-like compartment formed by hinged paper flaps. To pour milk, you'd block the compartment by squeezing the carton's sides; for cream, you'd pour while pressing the front and back.

7 Wheel Lift to Save Tires. This tandem wheel arrangement would let a driver lift alternate sets of wheels out of contact with the road. He might use it

to raise a flat tire until it could be properly changed or serviced, and raising up the wheels would also help save some rubber on light-load return trips.





6 Umbrella to Light Your Way. A flashlight in the handle of your umbrella might make it easier to pick your way through puddles on rainy nights. Better than a separate flashlight, it would leave one hand free for carrying bundles or coping with elusive door locks.

8 Acoustic Tile to Bounce Heat. With steam or hot water flowing through the snakelike, interconnected coils, these ceiling "tiles" would radiate heat into a room. For maximum heat reflection, the tiles would be set into metal trays. The spaces between the coils would be filled with sound-deadening material.



9 Pole to Clean Eaves. You wouldn't have to trundle out a ladder to sweep out your gutters if you had one of these long-reach scoops to do the job from the ground. A pair of clamshell-like spoons worked by a lever at the lower end of the lightweight, telescoping pole would quickly pick out the leaves and rubbish that were blocking up the drain.

The following patents have been issued on these inventions.
1. Patent No. 2,711,123 to Fred E. Seeger, Baltimore, 2. No. 2,738,387 to Harold G. Nelson, Huntington, Ill., 3. No. 2,739,197 to Stanley Ankud, Brooklyn, 4. No. 2,715,123 to Raymond C. Webster, Kansas City, Mo., 5. No. 2,701,118 to Carl V. Bergstrom, Portland, Ore., 6. No. 2,714,124 to Marlow J. Funk, Vicksburg, 7. No. 2,698,758 to Adolph Kohnberg, Minneapolis, 8. No. 2,711,731 to George M. Rapp, Hamden, Conn., 9. No. 2,720,409 to Paul H. Griffith, Gladstone, Pa.
Copies of patents may be ordered by number from the Commissioner of Patents, Washington 25, D.C. at 25 cents each. To write to an inventor, if the address given above is insufficient, you may address him by name and patent number in care of the Commissioner of Patents.

Highballing a trailer load of tall timber:

A Trucker's



Toughest Trick

Shifting constantly . . . down steep, tortuous grades . . . through ice, snow and mud . . . he rolls his load: up to 125 tons of swaying logs.

By Wesley S. Griswold

ONE of the toughest, tensest truck-driving jobs in the world involves short, tricky hauls with a gigantic, shifting load behind

It's the job of toting out of the Northwest's forests 70 to 125 tons of mammoth logs two or three times a day, easing them down grades as steep as 15 percent, urging them along undulating private roads that are narrowest where they are steepest. It goes on in snow, sleet and rain. The average distance to a mill from a "landing," where felled trees are snaked down from usually precipitous slopes to be hoisted onto the trucks, is 20 miles, scarcely any of it level.

I recently went along for a typical ride with Gus Pearson, 41, who, except for a noisy interval at a less taxing job with the Eighth Armored Division in Europe, has been hauling logs for the Weyerhaeuser Timber Company for 17 years.

A group of us waited for Gus in warm sunshine on a lofty landing overlooking a deep, serene valley in the lap of the Cascades. He was due from his first round trip of the day.

This landing, for loading trucks, was a reasonably wide



COOLING WATER will keep brakes from overheating in tricky 22-mile trip to lumber mill. The 200-gallon water tank behind the cab must be filled at least every other trip.

◀ **SLIPPERY GOING:** When rain turns dirt roads soft, driver must shift constantly to keep his 70-125 ton load of logs moving safely down treacherous grades. Road graders (background) work the year 'round.

perch hewn out of a cut-over slope that pitched like a steep roof from the landing's edge to the valley floor, 500 feet below. Above the landing, the ground climbed sharply for a few hundred feet to a thick stand of towering hemlocks, where lumbermen were busy in the undergrowth with the stripped bodies of felled trees.

On the landing, 2,200 feet above sea level, 1,700 feet higher than the distant mill, winch machinery was hauling in logs from the upper slope.

"Here comes Gus," someone shouted. I walked to one end of the landing and looked along the narrow dirt road that slanted abruptly down the steep hillside.

Piggy-back trailer. A yellow truck, in a thin veil of dust, was working its way up toward us. As I looked, it had reached a wide place in the road, and had begun to turn around so that it could back the rest of the way. I noted with surprise that it was carrying its trailer piggy-back.

"That's standard practice," the woods boss, genial overlord of a 160,000-acre tree farm, explained to me. "It makes it easier to turn the rig around at the mill, and that extra weight on the hind end helps the truck climb these 15-percent grades."

Gus had now backed onto the landing and stopped in the shadow of a shovel loader, with a gooseneck boom and tongs for handling logs. The loader clamped its tongs around the waist of the trailer and dangled it in the air while Gus drove the truck out from under it. The loader then set the trailer gently on the ground, and Gus went back to fasten it to the truck and hook up the air lines.

He got back into his cab, and as he did so a man in a safety helmet climbed to the roof of the cab and stood, with legs apart, on a platform there. The shovel loader hoisted a fat, 40-foot log from the pile assembled on the landing and laid it carefully on the trailer. As it reached for the next one, I noticed that the man standing on the cab roof moved his right foot, and Gus promptly backed the truck a few feet.



ROAD DUST is no hazard. Normal scheduling of trips from landing, at edge of forest, to mill, on Weyerhaeuser's Snoqualmie Falls (Wash.) tree farm, keeps trucks 30 minutes apart.



DOUBLE SHIFT, involving main and auxiliary transmissions, is often required in hauling logs over roads seldom level. For an instant, the driver must take both hands off the wheel.

"The second loader—that's the guy on the cab—has a foot buzzer, to signal the driver when to back and when to move ahead, depending on the length of the log," the woods boss told me.

Light load. In a surprisingly short time, the trailer was fully loaded—"overloaded," I told myself as I stared apprehensively at the looming heap of logs.

"This isn't much of a load," remarked the woods boss, as if reading my thoughts. "Not more than 140,000 pounds. Loads run as high as 250,000."

Gus and the second loader had now flung a half-inch steel chain, called a binder, around the logs and tightened it.



DWARFED BY A SPAR TREE 100 feet high, abandoned after being used in winching felled logs down to a landing, a log truck feels its way downgrade toward a distant mill. This is easy

Only now was Gus, a lean, relaxed man with calm gray eyes, free to say hello. We shook hands and he invited me to climb aboard.

The truck's 200-hp., six-cylinder diesel engine was rattling the windows as we waved to the men on the landing and started down what looked to me like a dusty roller-coaster track.

We had moved noisily forward only a few yards when Gus braked the truck to a halt and started to climb out of the cab.

"What's wrong?" I shouted.

"Just going to tighten the load again," he said casually. "It settles a bit once it's under way."

driving, by log-hauling standards. Most feared are winter conditions, with snowy roads worn smooth and a load of logs made slippery (and apt to shift on the trailer) by snow and ice.

He left me staring fixedly down the long dip to a distant curve, the outside of which was empty air. The tilt of the cab was such that I tended to slide forward on the seat, and I thought grimly of that great bundle of battering rams at my back.

He was back in a minute, grinning happily. He moved one of the two gear shifts and we nosed heavily forward.

"What gear are you in?" I asked.

"Second direct."

"How many speeds are there?"

"Twelve forward, four reverse. There are four direct forward speeds, four overdrives and four underdrives. I hardly



SUDDEN FLAT offers no special problem. The driver puts in a call by roadside company phone, or asks a passing driver to give the word, and a tire-changing crew quickly appears.

ever use underdrive, though, unless I got a real heavy load aboard."

Cooling hot brakes. The needle of the air-brake pressure gauge swung toward 60. Gus reached behind the left side of his seat. He noted my inquiring look.

"I'm opening the valve so water can get to the brakes. They're water-cooled, you know," he said.

"Are they pretty sure to hold?" I asked, nodding at the approaching curve.

"They're checked regularly."

"What happens if they don't?"

Gus looked amused. "I'd try to ditch us. If that didn't work, we'd jump. Company says, 'Save yourself. Never mind the truck or the load.' The truck would go off that curve like a rocket."

"Did that ever happen to you?"

"Naw. Only saw it happen once in 17 years. Didn't actually see it then, but I saw the truck afterwards. Those darn logs drove the whole front end right into the ground—it was nothing but a pile of pounded-up tin. Driver jumped okay."

By this time we were around the curve and approaching a gentler stretch of road leading through young trees. Gus shut off the water flow to the brakes.

Calling the shifts. He was shifting gears every few yards as the road gently traversed a series of little hills. Sensing

that I didn't know just what he was doing, he began to call out each shift.

We had moved from second direct—in which we were doing about five miles an hour on the steepest grade—through second overdrive to third direct and third overdrive, and back down again, before we had moved more than half a mile. We hadn't yet exceeded 20 m.p.h.

"Can't you go straight from one direct speed to the next?" I asked.

"No," Gus replied. "We're supposed to keep that tachometer needle at between 1500 and 1850 to get the best pulling power out of the engine. If you don't ease her through overdrive on the way from one direct speed to the next, the tach needle is apt to get way off."

"Are you conscious of that load behind you all the time?" I asked.

"Oh, sure. I can feel it pushing the truck along on every downgrade and dragging back on it on every upgrade. But I don't worry much about it except in winter. That's the real rough time. I have to shift at least a fourth more often in winter than in summer."

"You keeping track of the shifts?" he suddenly asked.

"I'm trying to," I said. "The way this cab is jumping around, I can hardly read what I'm writing."

He laughed. "Road gets smoother and wider pretty soon," he said.

The winter run. "To get back to winter," he continued. "The worst time is when the roads are covered with snow but worn smooth—or when it has thawed and then frozen again in late afternoon."

"The load starts trying to get ahead of the truck on the downgrades. I can't keep the brakes on all the time because the rear wheels will lock and she'll start running like a sled. So I have to let up on the brakes and speed up the engine to straighten us out. That makes us go faster than ever, of course, so I have to put on the brakes; then the load starts skidding all over again. It's rough."

Gus gazed solemnly off into the forest, reflecting on past terrors.

"Another thing," he said. "In winter,

[Continued on page 244]

Dot-and-Dash Doctors Save Lives at Sea



STRICKEN SAILOR who received life-saving medical aid by radio is lifted aboard Coast Guard cutter for fast trip to a shore hospital.

Anywhere in the world, a ship can radio a doctor—to treat a heart case or deliver a baby.

By Ernst Behrendt

THIRTY-FIVE years ago this fall, Captain Robert Huntington invented a new and effective method of saving lives

On this particular day Huntington, then principal of the Merchant Marine School at the New York Seamen's Church Institute, was looking out the window. It was foggy outside. Calls kept coming in over the short-wave radio from ships requesting a check on their positions. Huntington's thoughts went back to another foggy day, many years before, when he was sailing before the mast. A friend of his, falling down a hatch, broke both legs. The captain set the legs so badly that the boy was crippled for life.

An idea struck Huntington. If a captain could ask for a radio fix, couldn't he ask for medical advice just as well?

Probably Huntington did not foresee the world-wide scope of today's DHMEDICO, the service that provides medical advice by radio.

Suppose you become sick or have an accident on a ship without a doctor. The ship may be days away from the nearest port. Your symptoms may be severe and frightening. But whether you are on a tramp steamer in the Mediterranean, on a tuna boat off the Galápagos, or on a Norwegian whaler in the Antarctic Ocean, you will get medical help at least as fast as the city dweller who calls a doctor to his apartment.

There are dozens of radio stations to-

Typical radiograms show how long-distance doctors save lives

SHIP TO USPHS
HAVE MAN AGED 44 SUFFERING DELUSIONS OF PERSECUTION CANNOT SLEEP OR TAKE
NOURISHMENT BELIEVES THAT HIS LIFE IS BEING PLOTTED AGAINST HE IS DISTRAUGHT
AND TERRORSTRICKEN BUT NO PHYSICAL CAUSES ARE APPARENT. THUS FAR HAVE USED
NO MECHANICAL RESTRAINT. PATIENT NOT VIOLENT BUT CONDITION WORSENING.

USPHS TO SHIP
SEDATE PATIENT WITH PHENOBARBITAL AS NEEDED. PATIENT SHOULD BE RESTRAINED
IN ROOM BY SELF WITH ALL EXTRA GEAR REMOVED. HE SHOULD BE OBSERVED
FREQUENTLY AT IRREGULAR INTERVALS.

SHIP TO USPHS

DECK BAND AGE 23 PAIN AT BASE OF SPINAL COLUMN AND IN JOINTS OF LEGS
SEVERE HEADACHE AND PAIN BEHIND EYEBALLS TEMP 101.3 REPORTED SICK SUNDAY
FOUR DAYS AFTER LEAVING ORINOCO. ISOLATED. ADVISE.

USPHS TO SHIP

ARE FEVER AND SYMPTOMS CONSTANT OR INTERMITTENT. DOES PATIENT HAVE SHAKING
CHILLS AND VOMITING OR DIARRHEA. CAN HEAD BE BENT FORWARD TO TOUCH CHIN
TO CHEST OR DOES PAIN PREVENT IT. ANY COUGH. WHAT IS YOUR DESTINATION
AND EXPECTED TIME OF ARRIVAL AND YOUR NEAREST MAJOR PORT.

day that will perform this service, but the first one geared to handling emergency medical calls was created by Huntington. He talked his idea over with the Institute's superintendent, Reverend Archibald Mansfield. They enlisted the help of Henry A. Laughlin, a wealthy Philadelphian who donated \$3,000. The money went to build radio station KDKF, set up on the roof of the Institute's headquarters. The call letters had no special meaning, but sailors said they stood for Kome Doctor Kome Fixit.

KDKF was the first step. The second was to get competent medical men. Huntington went to Colonel E. K.

Sprague, head of a U.S. Public Health Service hospital in Manhattan. The hospital agreed to provide the doctors. Huntington provided the radio station. The captains provided the patients.

There were many patients right from the start—so many that the facilities of KDKF were soon overtaxed. Huntington got in touch with the Radio Corporation of America, and several of RCA's Radio-Marine coastal stations were put at the disposal of the sick and injured at sea. The idea spread. Other companies opened their channels to medical distress calls. Mackay Radio came in; so did Tropical, so did short-wave stations in



ON CONSTANT ALERT, operators at Marine Coast Stations like WCC at Chatham, Mass. (above), pick up sick calls from ships, relay them to waiting doctors who will "treat" patients by radio.



"HOUSE CALL" for a sea doctor is made on a bosun's chair to reach a critically ill seaman who requires immediate surgery. Here Coast Guard cutter transfers doctor to a freighter.

Canada, England, Italy and almost a score of other countries. No American radio station charges a cent even for the longest and most complicated medical messages; that's why the service is called DHMEDICO, the DH standing for "deadhead." (Not an ominous medical term, this is a word from railroad parlance meaning "riding free of charge.") With minor exceptions, foreign short-wave stations do not charge for emergency medical messages either.

How does DHMEDICO operate? The procedure starts with an emergency. Usually this happens on a small ship—larger ones have a doctor on board—and

other station in the world. A bell rings the moment a DHMEDICO is received. Immediately the message is teletyped to the company's main offices at 67 Broad Street in New York City. There the operator telephones the U.S. Public Health Service hospital on Staten Island.

There is always a MEDICO doctor on duty in the hospital. But the entire staff of the hospital, which is one of the largest and most modern teaching hospitals in the country, is at the disposal of any patient on any ship in any ocean, regardless of color, sex, or nationality.

How much time has elapsed by now since the captain called for help? An

SHIP TO USPHS
MAN SUFFERING OF HEART AND LUNG DISEASE NOW STANDING IN DIFFICULTY OF
HEALTHING AND SPEAKING APPEARS LIGHTLY SWOLLEN STRONG HEADACHE HE IS A VERY
FAT MAN COPIOUS TRANSPERSION. MAN INFORMS THAT IN SIMILAR CASE DOCTOR
LETTED SOME BLOOD. IS SANGUINE. IF NECESSARY PLEASE TELL ME QUANTITY
I MUST DIG OUT.

USPHS TO SHIP
MAN HAS PROBABLY CONGESTIVE HEART FAILURE. ADVISE BED REST IN SEMI
RECLINING POSITION. PLACE ON SALTFREE DIET. DO NOT BLEED.

SHIP TO USPHS
SHIP BOUND SAN FRANCISCO FROM MEXICO. MALE AGE 21 UP CONSCIOUS UNABLE TO TALK
DUE TO GASPING RESPIRATION 48 TO 60 LABORED GASPING. PULSE 106 TEMP NEAR
NORMAL UNABLE TO SIT PATIENT HAS TO WALK. INHALED BENZEDRENE PURCHASED
IN MEXICO TO RELIEVE HANGOVER AT AROUND 0800 THIS MORNING THREW BENZEDRENE
OVERBOARD WHEN HANDS BECAME PARALYZED. TOOK SOME PENICILLIN TABLETS.

USPHS TO SHIP
INDUCS VOMITING WITH FINGER THEN GIVE PHENOBARBITAL THREE GRAINS REPEAT IN
4 HOURS IF NECESSARY OR GIVE ONE GRAIN EVERY EIGHT HOURS AFTER INITIAL
DOSE. TREAT PATIENT FOR SHOCK IF PRESENT. GIVE PYRABENZAMINE OR BENEDRYL
100 MILLIGRAMS BY MOUTH IMMEDIATELY. IF SHOCK IS NOT PRESENT OBSERVE PATIENT
FOR SHOCK. IS PATIENT ALLERGIC TO PENICILLIN. KEEP US CLOSELY INFORMED.

the emergency is the kind that men trained in first aid can't cope with. Suppose a sailor is seriously injured or sick. The master of the ship tells the radio officer to send a message either to the nearest short-wave station or to one with which his company has a contract. The message is preceded by XXX or by the word DHMEDICO. DHMEDICO has top-minus-one priority; it immediately clears the air of all messages except SOS.

The Mackay station WSL, at Amagansett near Southampton, L.I., handles more ship-to-shore messages than any

average DHMEDICO message runs 40 or 50 words. The ship's radio operator may have needed three minutes to transmit the message. It took the teletype operator in Amagansett another two or three minutes to get the message to 67 Broad Street. From there to Staten Island by telephone is another two or three minutes. Total time elapsed so far: seven to nine minutes, regardless of whether the ship is off Long Island or off Ceylon.

Now, the doctor probably won't give a snap answer. Perhaps the captain's description of the case is a bit sketchy and

the doctor wants to ask questions. How old is the patient? Is his face pale or flushed? How long has he been sick? The captain answers and maybe the doctor asks still more questions. His responsibility is tremendous. He can't see the patient and has to accept an untrained man's description.

Finally, sometimes after the exchange of a half dozen messages, the doctor is satisfied. He arrives at a tentative diagnosis and prescribes treatment. This may be "600,000 units of penicillin," or "make him vomit," or "for Goshakes, don't pull that tooth," or "try to get to the nearest port as fast as you can."

It may be absolutely necessary to remove the man without delay. In such a case the hospital gets in touch with the Coast Guard and its marvelous rescue service swings into action. They may send a cutter, a helicopter or a seaplane to remove the patient. They may flash word to an ocean liner asking its captain to change course and dispatch a doctor to the patient. They may even fly a surgeon out to the ship by helicopter, drop him there, instruments, drugs, and all, and hope for the best.

Rarely, it may become necessary to tell the captain to perform an emergency

operation; but this is a last desperate resort when the patient's life is in imminent danger. There are cases on record in which captains were told how to hone paring knives for an appendectomy.

Each of the major private radio companies and the Coast Guard handles hundreds of DHMEDICO calls each year. Their performance record is excellent. In one year, RCA listed exactly two fatalities among more than a thousand cases; it is unlikely that these two could have been saved even in a hospital.

The range of accidents and diseases treated via DHMEDICO is unlimited. There are perennial stand-bys: broken arms and legs, burns, gangrenous wounds. There are ominous infections: diphtheria or meningitis. ("Isolate patient from other crew members.") There are mental cases. ("Give barbiturates and see that he doesn't hurt himself.")

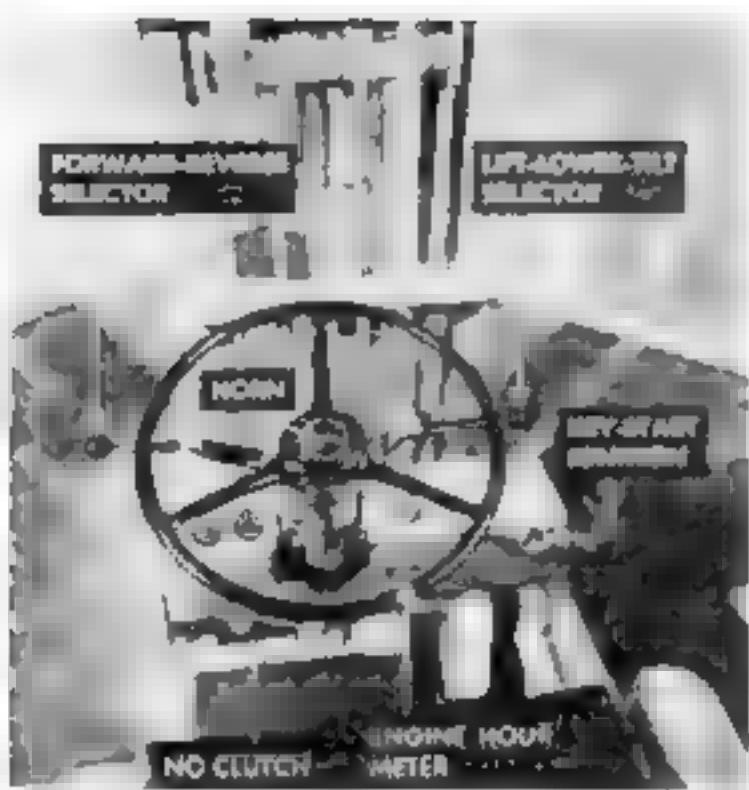
There are weird cases, as when a skipper reports: "Almost every one of my men has a rash all over," and after a dozen frantic messages back and forth the DHMEDICO doctor establishes the fact that the ship sailed through a cloud of butterflies whose wings are toxic, though non-fatal. Long-distance treat-

[Continued on page 238]

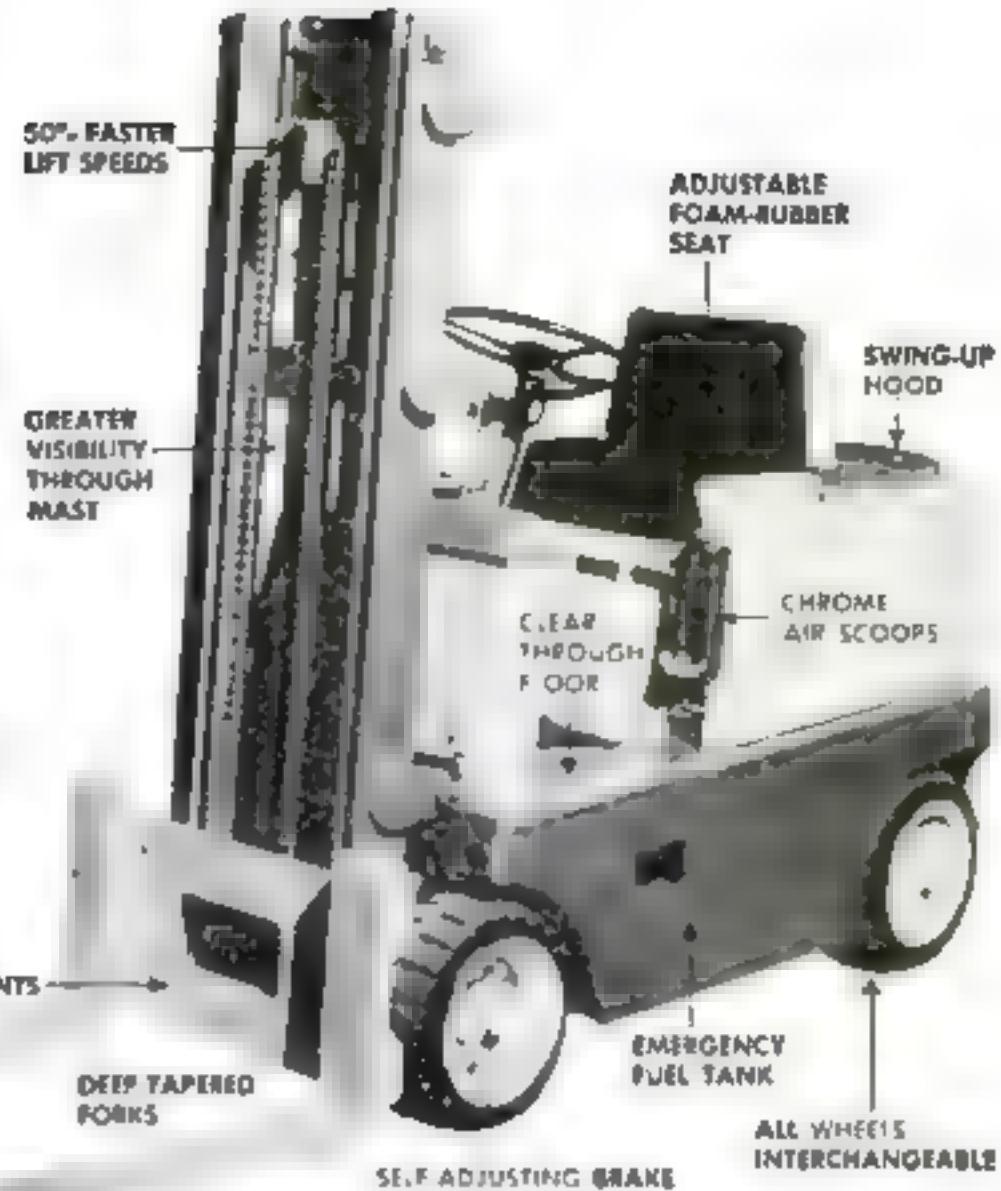


COAST GUARD COPTER, in severe cases, plucks a patient from a ship and sets him neatly down

on the front lawn of the nearest big-city hospital —often within minutes of getting a radio call.



MORE ATTACHMENTS →



THE fork-lift truck—that industrial scooter with the Frankenstein arms—now has glamor. It also boasts mechanical features that put it in a class with the best of the 1957 road cars.

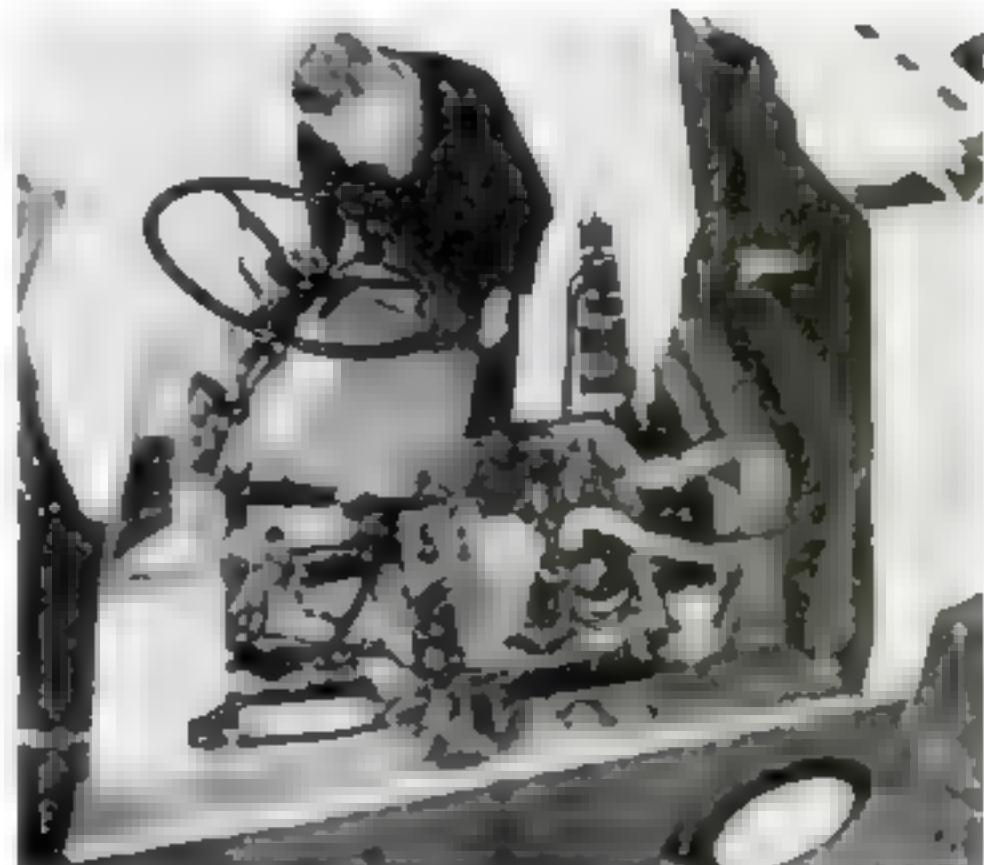
The air scoops for the under-seat engine are chromed, no less. The main controls are on the steering column, like a regular automobile's. The seat is cushioned with foam rubber. There's a 12-volt electrical system, an automatic transmission, self-adjusting brakes, tubeless tires, a longer wheelbase and even an emergency gasoline supply stashed under the seat for the absent-minded driver.

And speed? The best of these jobs will streak along at 12 miles an hour!

Pictured here is the new Clark fork-lift, described by the manufacturer as a first major departure in the design of such vehicles. It was styled by Harley Earl, the General Motors man who dashed off such exotic things as the gas-turbine Firebird.

The Clark line also includes hard-tire fork lifts and some with electric drives.

The Fork-Lift Truck Goes High-Style



TLTING SEAT exposes engine compartment; removing floorplate gives quick access to transmission.

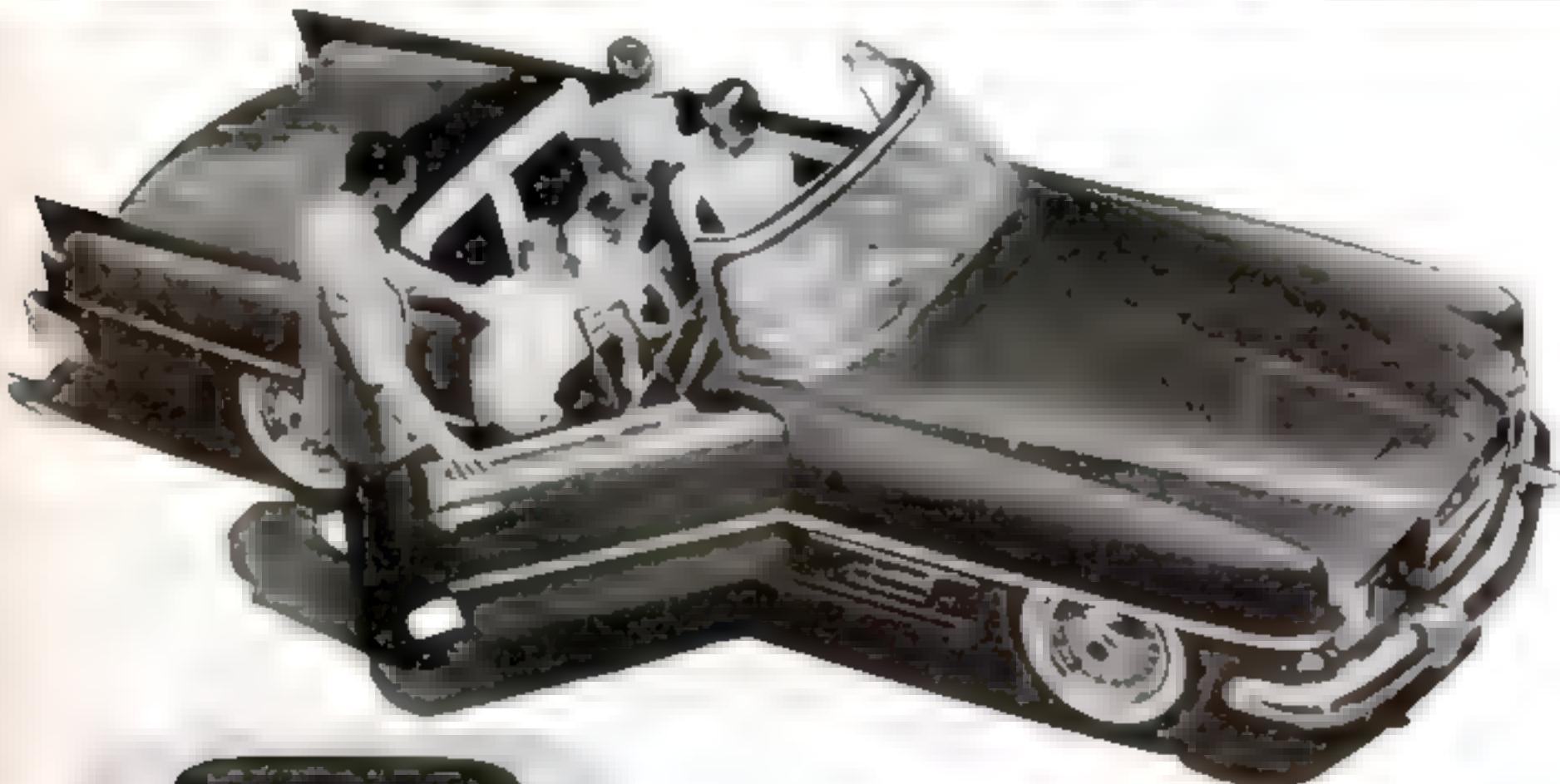
NEW SPORTSTER: Dodge with

IT TAKES a lot of transatlantic travel to build the "Dual-Ghia." First a Dodge frame goes from Detroit to Italy, to be fitted with a de luxe Ghia body. Then the body and frame go back to De-

troit, to be fitted with running gear and a hot V-8, also Dodge-built. Finally, the completed car goes to its U.S. buyer, a man who must: (a) be at the top of the waiting list and (b) have almost \$8,000.



MADE-IN-ITALY BODY blends with American-bred horsepower. The steel body parts are hand-formed abroad over aluminum dies.



LIKE AMERICAN CARS in its dimensions, the Dual-Ghia is roomy enough for four passengers and maybe five. Getting aboard presents no special difficulties even for Grandma.



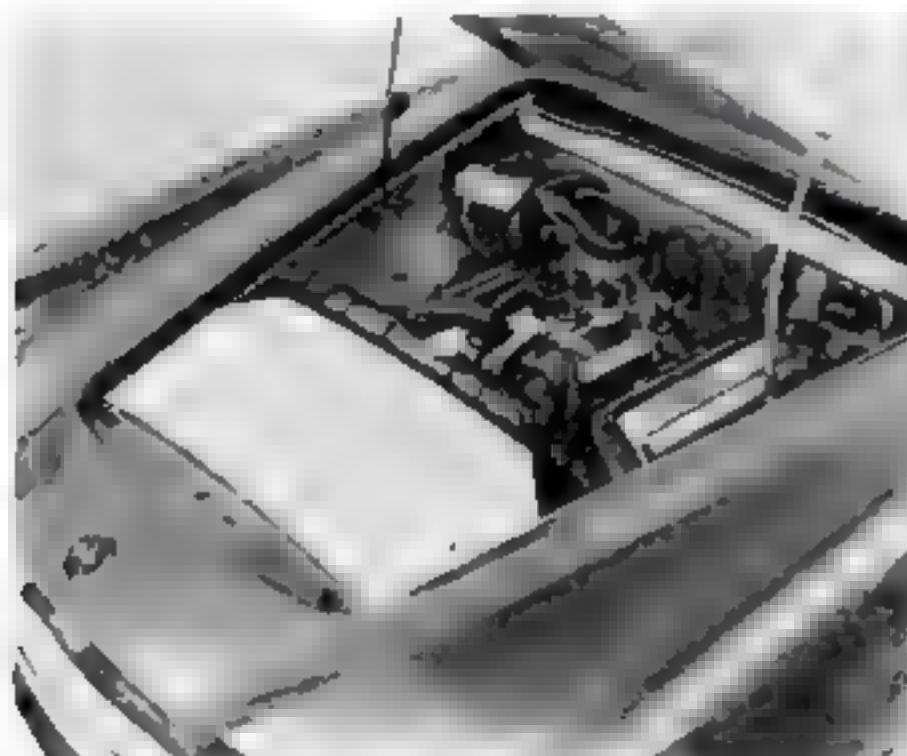
SPRINGING IS STANDARD Dodge 500, both front and rear, and an enlightened weight distribution makes you want to keep on driving. Car is 200 pounds lighter than the Dodge.

an Italian Accent

The buyer gets a fast, canvas-topped carriage for four. Top speed is above 120 m.p.h.; acceleration is close to eight seconds, zero-to-60, and the elegance is overpowering. Dual-Motors, the Detroit

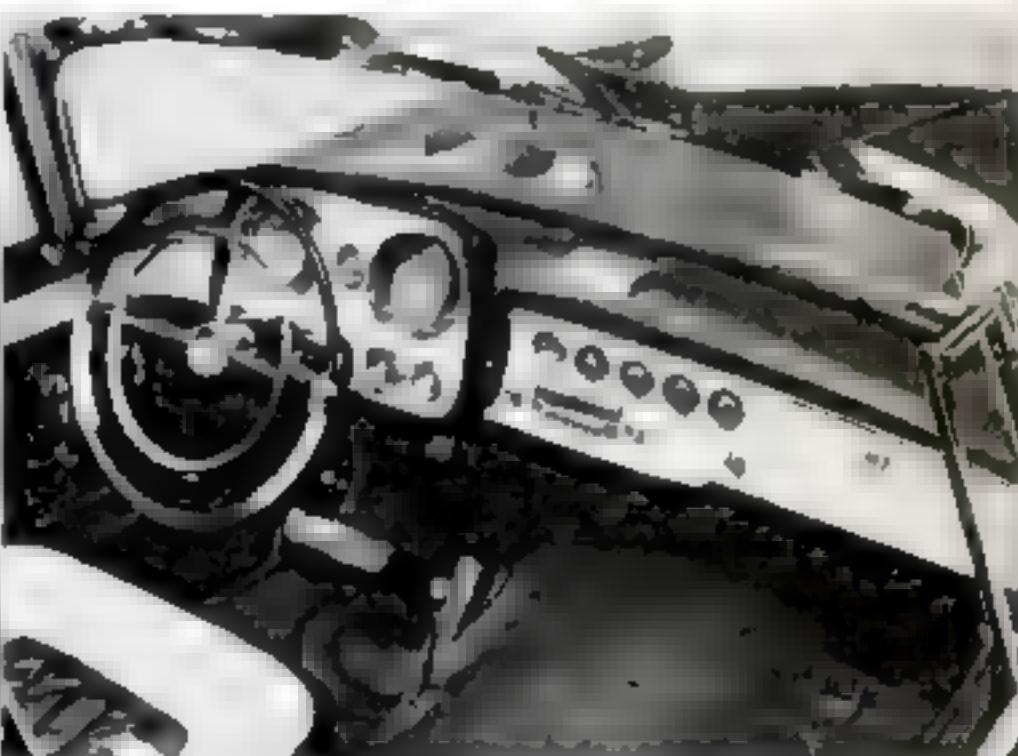
firm that assembles the car, notes that its leather comes from English beasts that have never known barbed wire; and that the Ghia paint-shop foreman is so artistic he cries if his work is criticized.

CLEAN FENDER LINES, sweeping front to back, are unbroken by the headlights, which are housed within the grille. Handsome aircoop in front really gulps air to cool the 230-hp. engine.



DODGE 300 with PowerFlite transmission is normal engine. It is mounted six inches farther back than in Dodge, improving weight balance.

CHROME SPARE-TIRE hold-down is an example of the attention given to fine detail, though finding luggage space may be a puzzle.



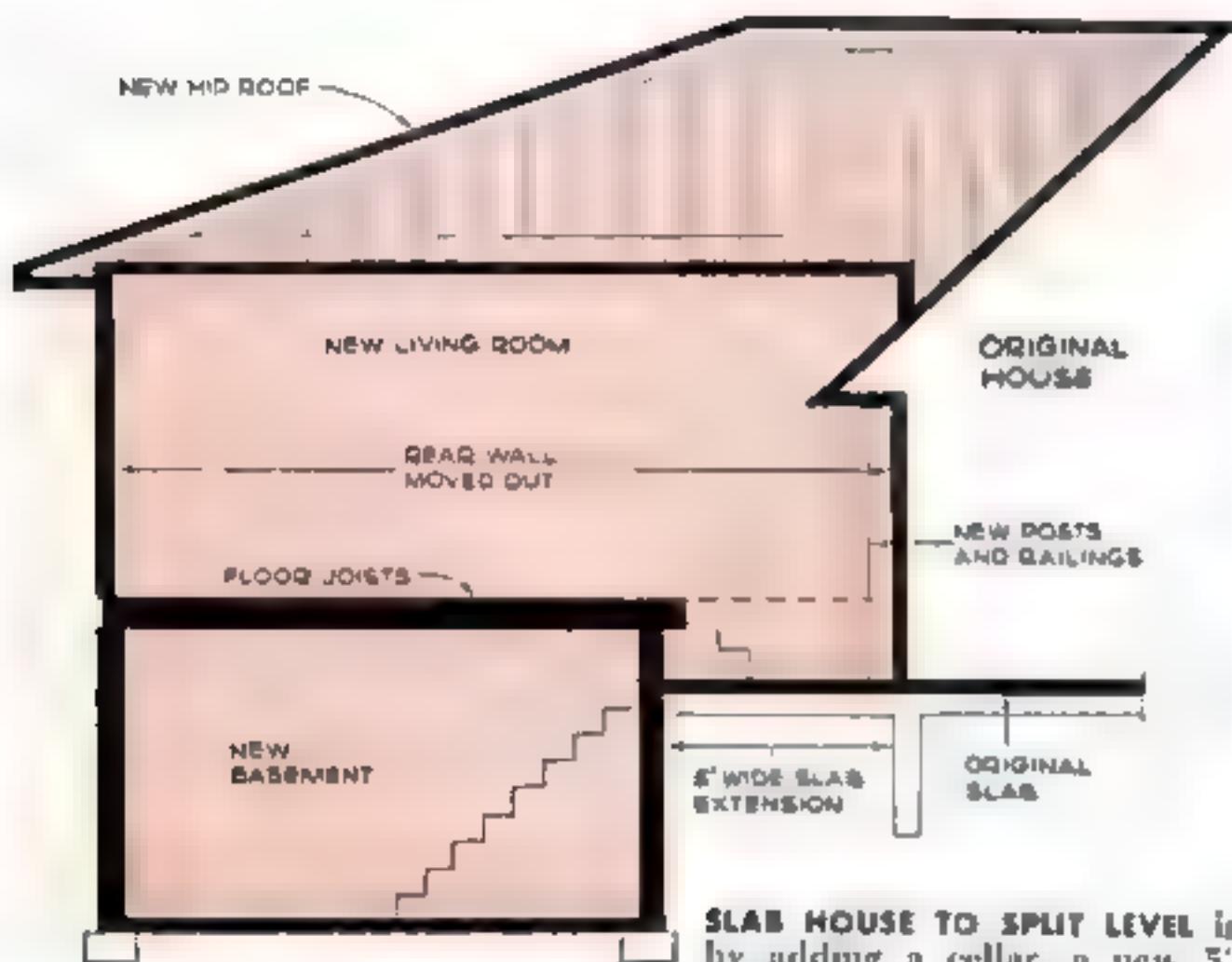
MODIFIED AMERICAN CONTROLS simplify the lot of women drivers. But it takes 11 full turns of the handle to raise or lower a window.

AMERICAN-MADE MOVING PARTS—engine, running gear and undercarriage—lets the Dual-Ghia use the local garage for most servicing.



Cramped for space (as who isn't?) this growing family pushed out a wall, raised a new roof, and wound up with

Nine Rooms in Levittown



SLAB HOUSE TO SPLIT LEVEL is transformation achieved by adding a cellar, a new 5' slab, and a hip roof to Levittown home. Original rear wall with door and large window is moved back as shown in two photos below.

By Jack Springer

LIKE many young couples these days, Mr. and Mrs. Herman Freid of Levittown, L.I., decided a few months ago that they needed more space for their growing family.

They had two children and were expecting a third. They lived in a tiny ranch house built on a concrete slab with a cramped kitchen and living room, no dining room, no basement and almost no storage space.

Yet they had many friends in Levittown, belonged to neighborhood clubs, liked the town's famous free swimming pools. Unlike hundreds of other space-



Remodeled house has new





dining room in what was original living room. Posts support girder where rear wall was removed.

starved young families in this big town of small houses, who lately have pulled up their roots and moved away to bigger homes, the Freids—while wanting more room—also wanted to stay where they were.

So they took their problem to an architect. They wound up with two things:

- A slick split-level house with a large basement and 1,056 more square feet of floor space, and

- A booming home-improvement business with contracts to make the same additions to the houses of 45 of their neighbors.

The Freids originally had six tiny rooms. Now they own a spacious nine-room house with five bedrooms, two baths, a magnificent 20-by-19-foot living room, a huge dining room, a kitchen with a wall-hung refrigerator and enough din-



HOW IT WAS. Here's the former living room. Picture-window wall is the one that was moved.

ing space to seat six comfortably. They figure that the original house plus improvements cost them about \$14,500—a good \$6,000 less, Fried says, than they could have bought a place with com-



RAISED LIVING ROOM is two steps above the floor of the original house, giving ample cellar headroom. A railing sets it off.

OVERHANG OF ROOF was cut back to allow inside wall of the

parable space elsewhere in this area.

The Freids' problem was one that is shared by millions of up-and-coming young Americans. Real-estate experts report that families all over the country are looking for more space. When the Federal Housing Administrator asked women recently to tell him what kind of houses they wanted, the most frequent answer was that they wanted additional room more than anything else.

In Levittown itself, which mushroomed on Long Island's potato farms right after World War II, homeowners have tried every trick in the book to get more space. They've made so many changes that when you drive down a Levittown street you would hardly suspect that all of the houses were once basically the same in design.

But nobody had tried the slab-into-split stunt until the Freids consulted Herman H. York, a local architect who has designed some 50,000 homes—most of them situated on Long Island—since World War II.

Knew what she wanted. Mrs. Freid told York that she found two things basically wrong with her Levittown slab house: It had no dining room, and she didn't feel right serving company dinners in an already crowded kitchen. And it had no basement to store the things that were pushing out tiny closet walls.

York reasoned that the only way she could get what she wanted was by building a new section with a basement, and then linking it with the old basementless house.

First a foundation was dug in the back yard for the basement part of the addition. The cellar wall was set five feet away from the existing footings of the house. Digging any closer, York figured, might result in dirt washing away from under the old footings, endangering the original house.

After the foundation was in, floor joists were laid for the new section. These rest on the two new basement walls and continue over the five-foot-wide buffer between the foundation of the old house and the foundation of the addition.

The main floor of the new section is two steps higher than the old floor. The raised floor made it possible to save on excavating costs for the basement.

After the addition was rough-framed, the entire back window wall of the original house was removed in a unit and put into place as the back wall of the addition.

The rear wall of the living room originally had a 4-by-12 girder over the window unit. The girder is necessary to hold up the roof. When the old rear wall was taken off, two 4-by-4 posts were erected



new living room to rise straight up above supporting posts.

YOU STEP DOWN from the new living room to enter the dining room. The original house had only a kitchen dining area

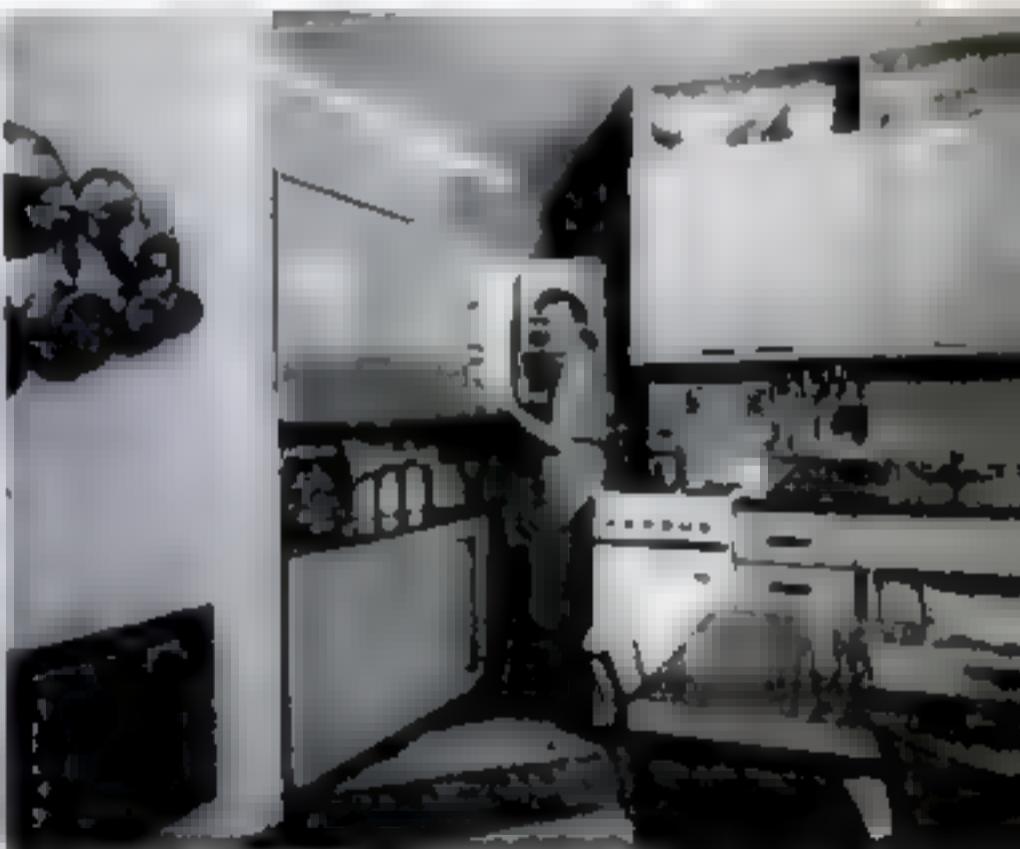
to hold the girder up. With a wrought-iron railing, the posts form an attractive divider between the old living room (now the dining room) and the new living room.

In the rear of the old house was a bedroom, with windows on the side as

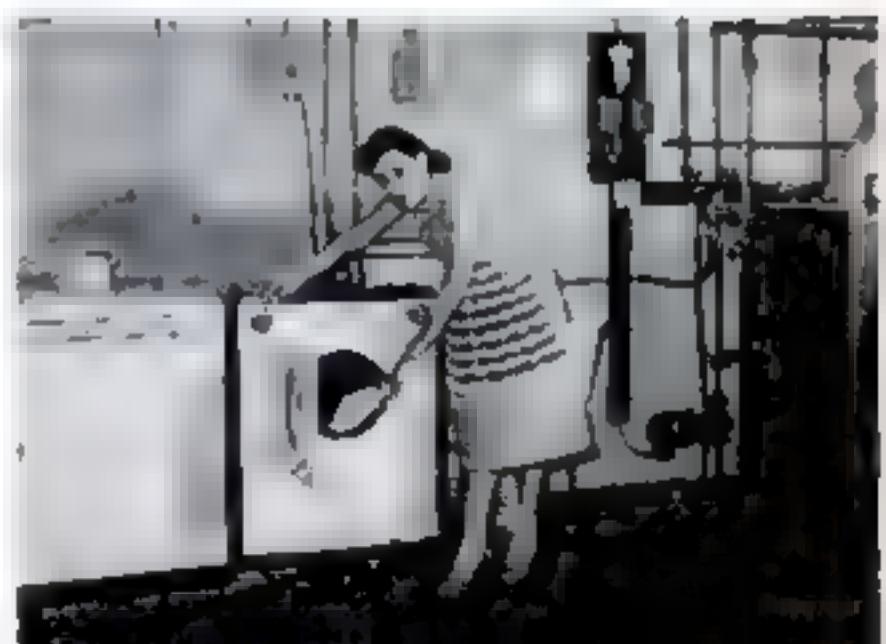
well as in the rear. The back windows were closed up. The old rear wall became a partition wall for a new closet that opens onto the new bedroom.

The addition has a hip roof, built right into the old roof. This operation was almost as simple as building a new porch.

Moving utilities to the basement adds kitchen convenience



STANDARD KITCHEN, shown directly above, has furnace, water heater and clothes washer on one side of fireplace. New basement allows these to be moved out and replaced by a wall refrigerator and base cabinet (above right). There is room for a washer, dryer and laundry tub in the basement (photo at right) as well as a play area for the children. A new chimney was built for the larger furnace that was required to heat the expanded house.



roof and hooking it into the existing house. The old roof overhang had to be cut, however, so that instead of projecting into the new area, the old rafters end flush at the wall.

Plumbing and heating changes were held to a minimum. Existing water lines were extended to the basement to supply the clothes washer, and a larger furnace was installed. This was necessary to heat the bigger house.

The clothes washer drains into an outside dry well, so no expensive connections to the sewer lines were required.

The addition gave the Freids more kitchen space. When the house was built, water heater, furnace and clothes washer were all jammed into the kitchen. There was room for only a tiny refrigerator and no space for a dishwasher.

After they got the basement, the Freids moved the clothes washer, heater and furnace downstairs and found themselves with room for a modern wall-hung refrigerator, a dishwasher, and badly needed cabinet space in the kitchen.

The basement also gives them a recreation area where David, their six-year-old, has set up his model train layout. Space is left over for a storage area.

When the Freids began digging for their addition, neighbors' gags flew thick and fast. Somebody hit on the title, "Split-Levet" for the new house.

But when the finishing touches were made, the neighbors' eyes began popping at the vast amount of new space it provided. They started to ask how they could get a job like it. Although the Freids had never been connected with building before (Freid is an accountant), Mrs. Nina Freid set up a corporation known as Split-Levet, Inc.

They offer to enlarge any ranch house like theirs in Levittown at a cost of \$6,590. Construction work is done by the contractor who handled their job.

The addition provides 640 square feet of floor space in the new living room and bedroom and 416 square feet of basement floor space—for about \$6 per square foot. In new houses on Long Island the price runs \$12 and up.

Homeowner Who Lengthened His House Became a Contractor



SECOND ROOF LINE shows where an extra room and a big garage were added. New room became the kitchen of the remodeled house.

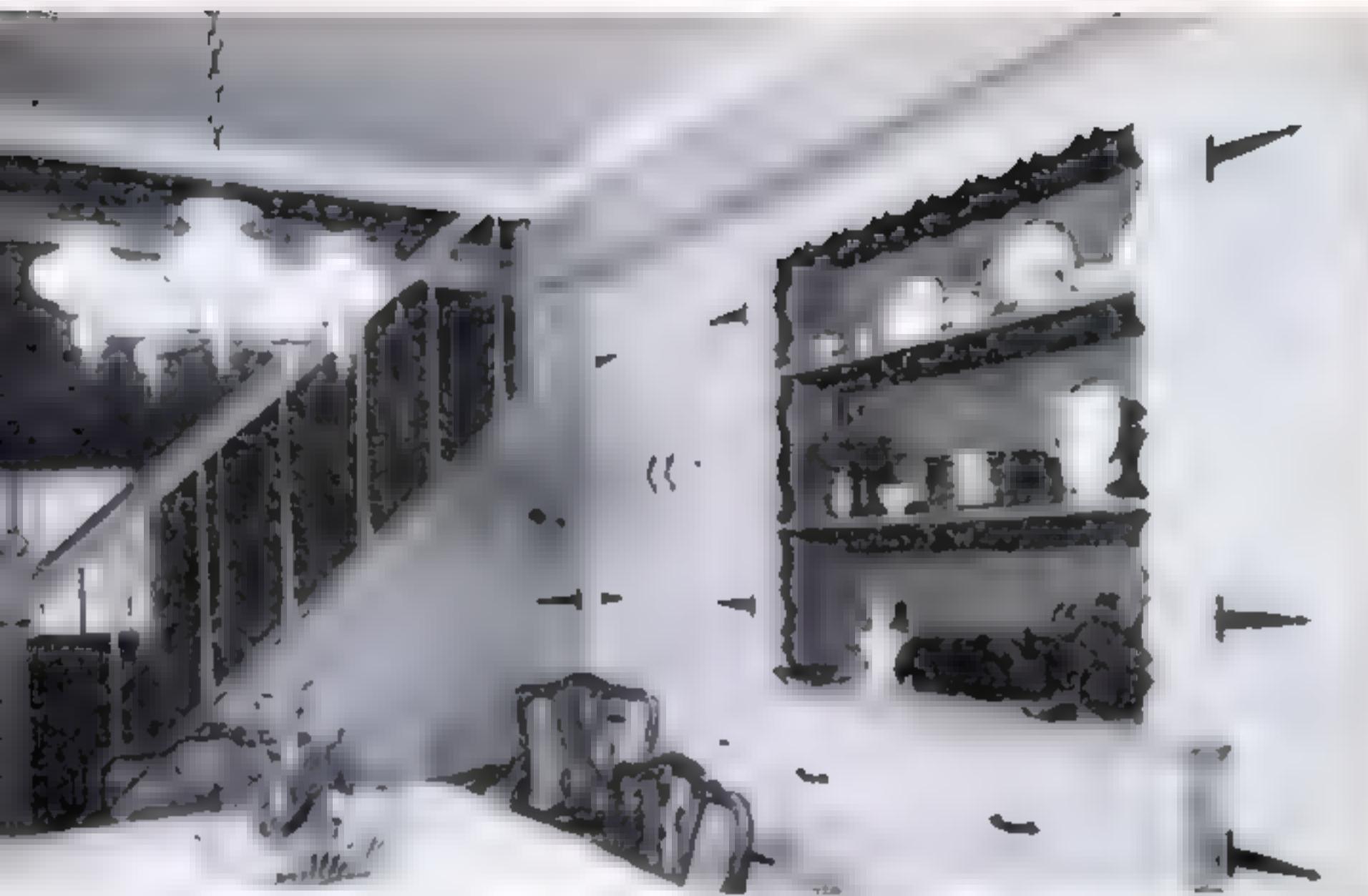
EMPLOYED by a cargo airline when he moved to Levittown in 1954, Herbert Richheimer soon observed that everybody, like the Freids in the preceding article, wanted more elbow room. So he bought himself some tools, sketched plans, and remodeled his own home. With it as his sales sample, he built a thriving business of adding new space to old Levitt houses.



FREEZER IS FLUSH with wall of hallway; in back, it extends into the garage, taking up no house space at all. A clothes dryer of the front-opening type could be installed in the same way.



A CORNER CABINET in this house disguises access area to the furnace, which is installed under the steps. Cabinet can be rolled out for furnace repairs and adjustments. The open toe space below admits air to burner.

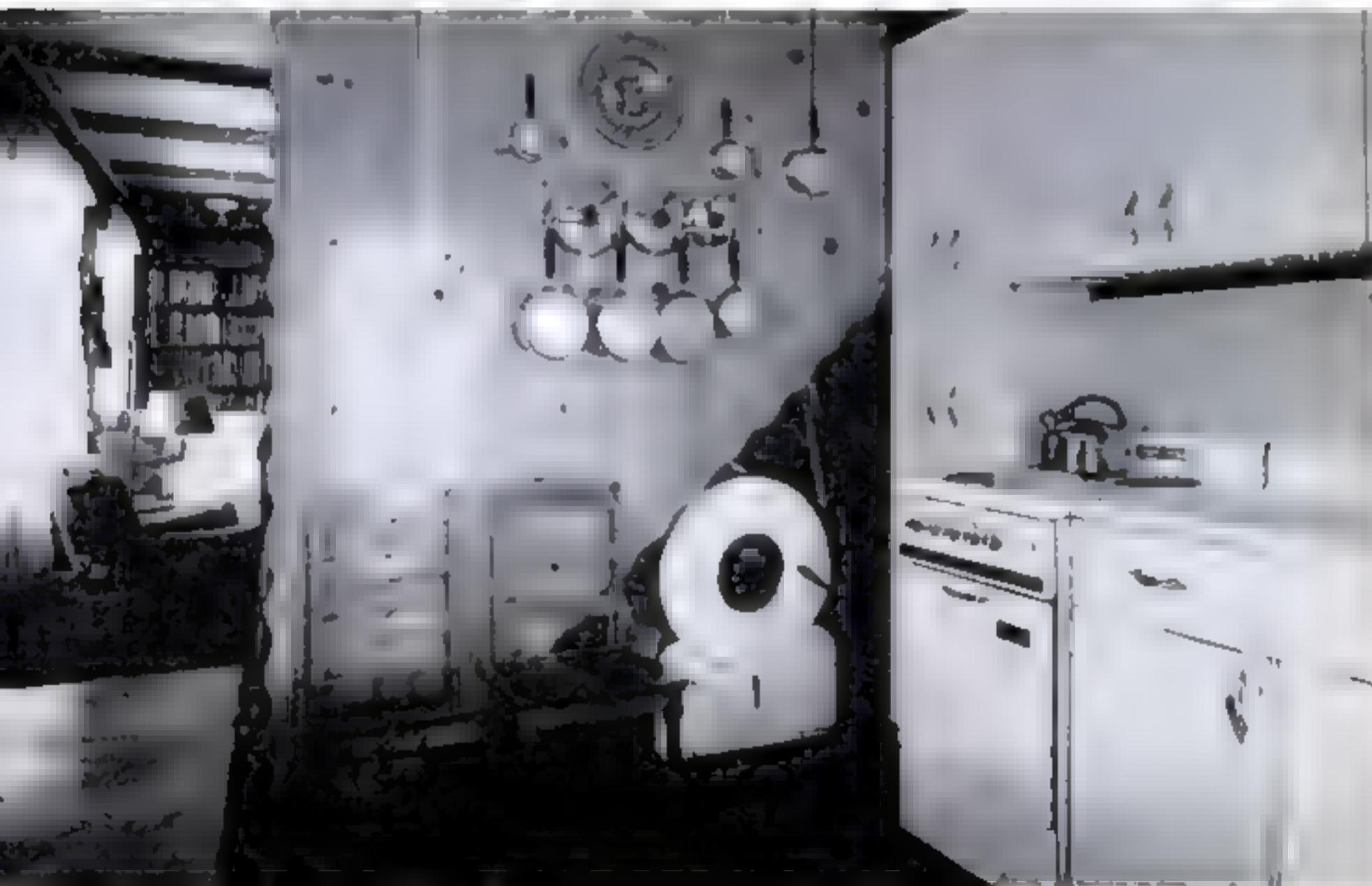


THIS NEW DINING ROOM is a conversion of the original kitchen area shown below. Former trim over what were kitchen cabinets is now a

warm-air duct. Attractive cupboards replace old kitchen cabinets. False fronts in bottom area conceal the old plumbing lines.

TYPICAL KITCHEN looked like this before conversion. Some remodeled homes have desks, TV

sets, closets and even a powder room in the under-stairs space where washer stands here.



The Army's new Drake is a

Sea-Going

Dwarfing the Duck of World War II, this exciting new amphibian has eight wheels, two engines.

WHEN Army Ordnance and General Motors men had to drive an experimental "Drake" from surf tests in California to sand tests in Texas recently, the prospect gave them the fidgets. The huge new amphibious truck was 24 inches wider than any conventional highway vehicle; it was so high that its cab afforded a view into the second story of houses; and its value, in time and dollars, was so great that absently crunching it into a low bridge would have been disaster.

The nervousness, it turned out, was needless. The big amphibian roared along desert and mountain roads at a comfortable 45 m.p.h. Width was no problem, except perhaps to the peace of mind of oncoming motorists, faced with an olive-drab dinosaur that breathed smoke from its front wheel wells.

About the only hindrance on the thousand-mile trip, in fact, came when



Hitting the beach with wide-open throttle, the

the big beast wouldn't fit the loading ramp of a California ferry. This wasn't really a difficulty. The Drake just nosed down a beach, plashed into the water, and churned at 7 knots across the bay in company with a curious Coast Guard cutter. On the other side it clambered out,



EIGHT SHIFT LEVERS sprout up, but operation is not tricky. Two longer pairs are for land or water travel, shorter for pumps. Torque-converter knobs on dash control most shifts.



UNDER THE TOEBOARD are two big six-cylinder truck engines. Not "tender," they can thunder for hours—or days—without missing a beat. Air cleaners are cocked to save headspace.

Eight-Ton Truck



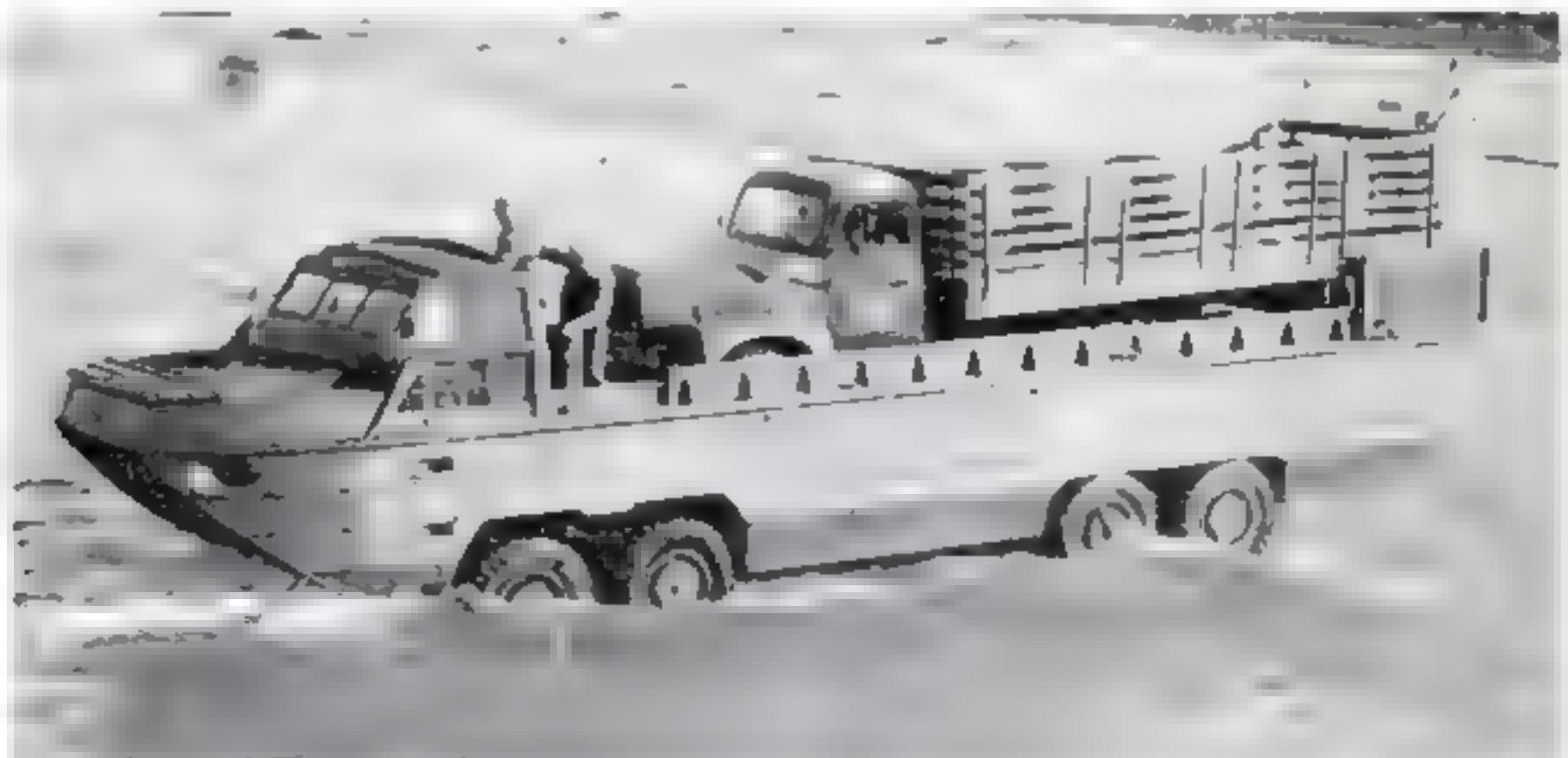
Drake accelerates to its top land speed of about 45 miles per hour within a few seconds.

drained its bilges, and nosed about until it found the highway it had abandoned.

Built under an experimental Army Ordnance contract with CMIC Truck and Coach, the Drake is the grandson of the World War II Duck, a 2½-ton amphibian that won wide use in the closing years of

the war. It is the son of the "Superduck," an experimental four-tonner built in 1953. On virtually all counts the Drake is gee-whizzy.

- Forty-two feet long and 10 feet wide, it has immense cargo capacity. The Drake's official eight-ton rating is highly



Sea voyage for a six-by-six: An Army truck rides piggyback aboard the ponderous amphibian.

conservative; a loaded six-by-six Army truck fits aboard with ease, and surf tests indicate it can take percent overloads without swamping.

- It has two complete air-suspension systems. One supports the eight big wheels on air bellows, as on big buses, to give a smooth, load-compensated ride. The other system, used afloat, works in the opposite way. Its job is to tuck up the wheels into their wells, to reduce the water drag that would result if they drooped down 15 inches below the hull.
- At full load, it can exceed 40 m.p.h. on land and eight m.p.h. in water. The highway fuel consumption of about three miles per gallon jumps to a peak of 25 gallons per hour afloat. Four 60-gallon gas tanks give it a respectable range.
- Two husky 302-cu.-in. engines, rated at better than 155 hp. apiece, share the work under an intricate division of duties:

1. On land, on firm going, the right engine drives the fourth axle and the left drives the third axle;

2. If the going is soft, the right engine drives the second and fourth axle, the left one the first and third.

3. Afloat, each engine drives one retractable propeller. For extreme maneuverability, one prop churns forward while the other thrashes astern.

4. If as a result of enemy action or natural cussedness one engine conks out, the Drake can get along fine on the other.

Modern design. The Drake's aluminum hull is crammed with mechanical slick tricks. As on its predecessors, tires can be deflated or pumped up on the run—from 50 pounds on the highway down to 12 pounds for soft sand. In tests, 14 machine-gun bullets were pumped through one tire without discouraging it noticeably.

The engine exhausts are several inches below the load waterline—sometimes feet below in heavy surf—but big loops are provided in the tailpipes. These, combined with the stertorous breathing of the heavy engines, let the Drake blow its pipes clear in any weather.

Heavy-duty, power-boosted brakes are located at the ends of the power trains, in



UNTIL THE OCEAN BOILS, the two engines won't overheat on sea duty, thanks to these sea coolers that help out the regular radiators inside. They're recessed in the hull for safety.

the wheels themselves, so that the heaviest braking loads are not thrown on all the gears and U-joints in the train.

The complete power train, incidentally, looks at first like a piece of lunatic complexity. It turns out to make good sense: a pair of power trains adapted from the sturdy six-by-six truck, run in parallel. Briefly, each engine feeds a torque converter and transmission, and then its own transfer case. From the two

BURIED TAILPIPE (arrow) dumps the exhaust in the wheel wells. Hot gases haven't hurt the tires any on desert runs. A power-steering system guides all four of the front wheels.





PROPS DESCEND at the touch of an air valve feeding the two lift cylinders in background. The skogs that guard the big screws from damage by solid objects also rise and fall with them.

transfer cases power is distributed to the four axles and the two props. The driver has a choice of 12 forward speeds plus torque converters.

Although the Drake has proved remarkably dry on surf trials, it has centrifugal pumps of high capacity, capable of draining the bilges faster than a teenager can pull bottom on an ice-cream soda with two big straws.

One of the oddest gadgets on the elab-

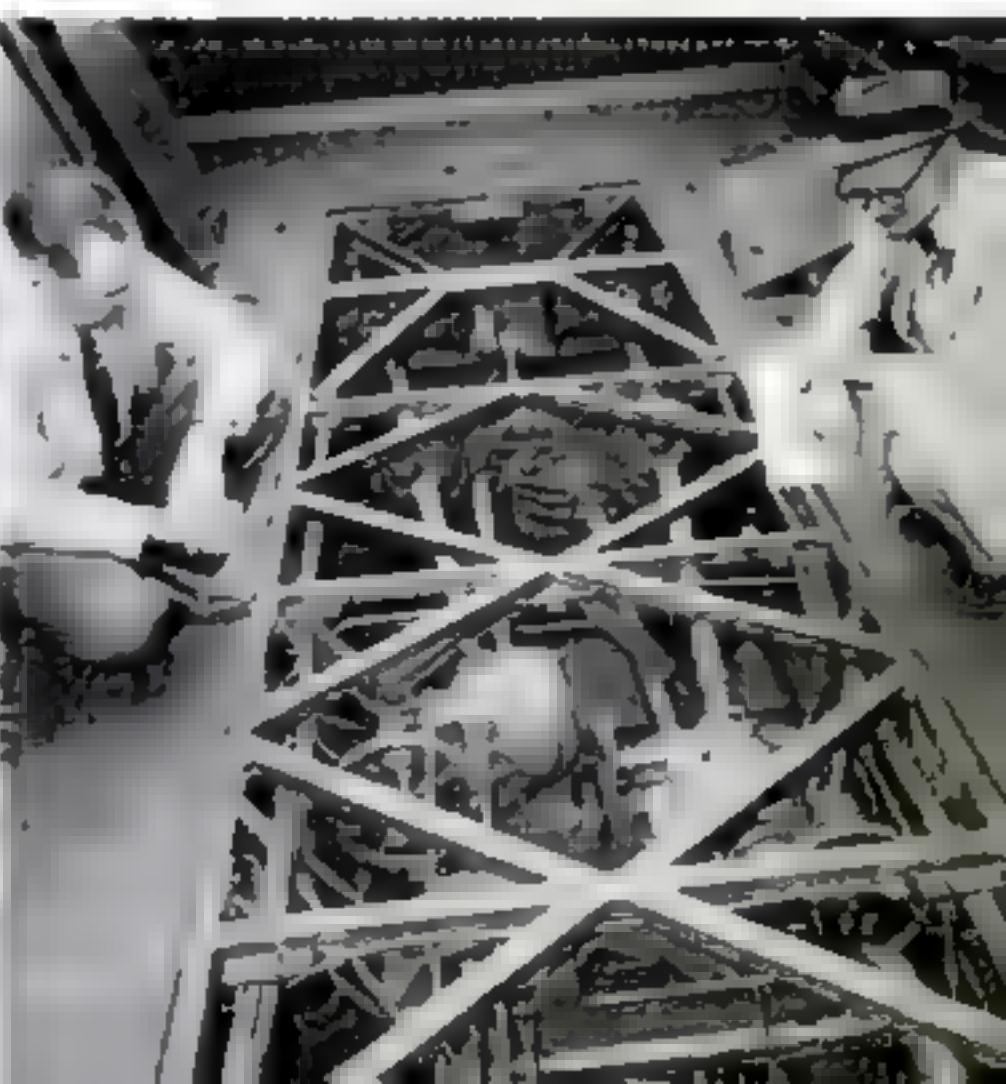
"DROP BOXES"—sealed gear cases—lower the wheel spindles almost a foot below the axle line, and also add extra gear reduction. The air-suspension bellows are in the wheel wells.



PROPS TUCK UP for travel on land. Note that the knuckles for water steering are just ahead of the props, not on the front ends of shafts. The Drake turns far tighter than the Duck did.

orate instrument panel of the Drake is a device called the "Wheel Position Indicator." On the old Duck, an unwary driver could come charging into a landing on a beach with his wheels cocked way over, something that was usually embarrassing and sometimes disastrous. A Drake pilot is spared the risk of this *faux pas*, a glance at the W.P.I. tells him where he'll be pointed when his wheels start rolling.—Frank Rowsome Jr.

THICKET OF SHAFTS under cargo floor leads power from two engines to four differentials, eight wheels, two props, two bilge pumps and a winch. Under way, everything spins gaily.



What would you do in these typical



1 **YOU'RE ON A SHARP CURVE** on a high-speed road when your left rear tire goes flat. You can't pull off the pavement because you're in a rock cut and there are no shoulders. You have no flares or flags. It's a brand-new tire. You would—

continue running slowly on the tire until you come to a turnout.

wait for a patrol car to show up and protect your rear while you change the tire.

pull close to the rock wall and run back and flag traffic until someone lends you flares or flags for protection.

change the tire fast, waiting until later to replace some lugs and the hub cap.

Note: These are not actual Army test items, but similar items used for illustrative purposes only.

How Army Tests Pick Good Drivers

By Edward D. Fales Jr.

HAVE you ever driven a car with a straight exhaust pipe? Do you like cops? Are you deeply religious? And what do you do when the car ahead of you makes a sudden stop?

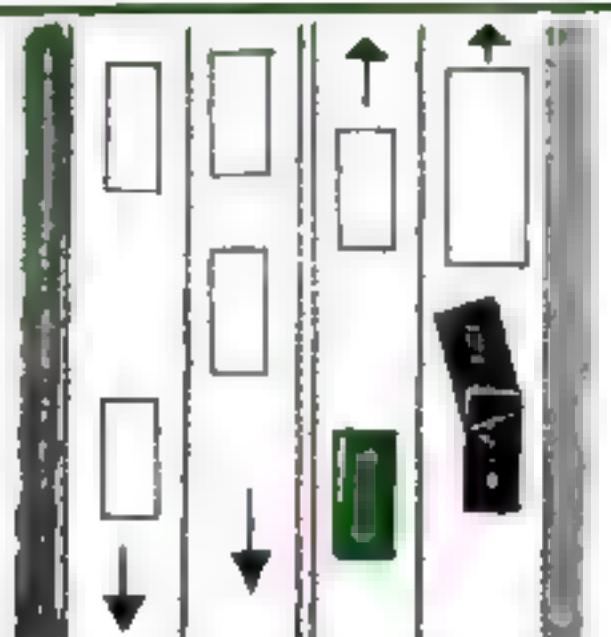
Your answers, the Army is finding, tell something about your chances of driving for the next few years without a road crash. And that, in today's Army, is a subject that is getting more attention every day—for two reasons: the Army simply can't afford to lose good men in auto crashes; and some vehicles that GIs

drive nowadays cost as much as \$40,000.

A group of top U. S. psychologists working with Dr. J. E. Uhlaner have devised new tests that tend to show who can get through today's tough traffic without accidents, and who can't. By next spring, one million GIs and Army civilian employees will have taken the tests. And by summer the Army expects to cut its crash rate five to 10 percent by weeding out the "crash-prone" drivers.

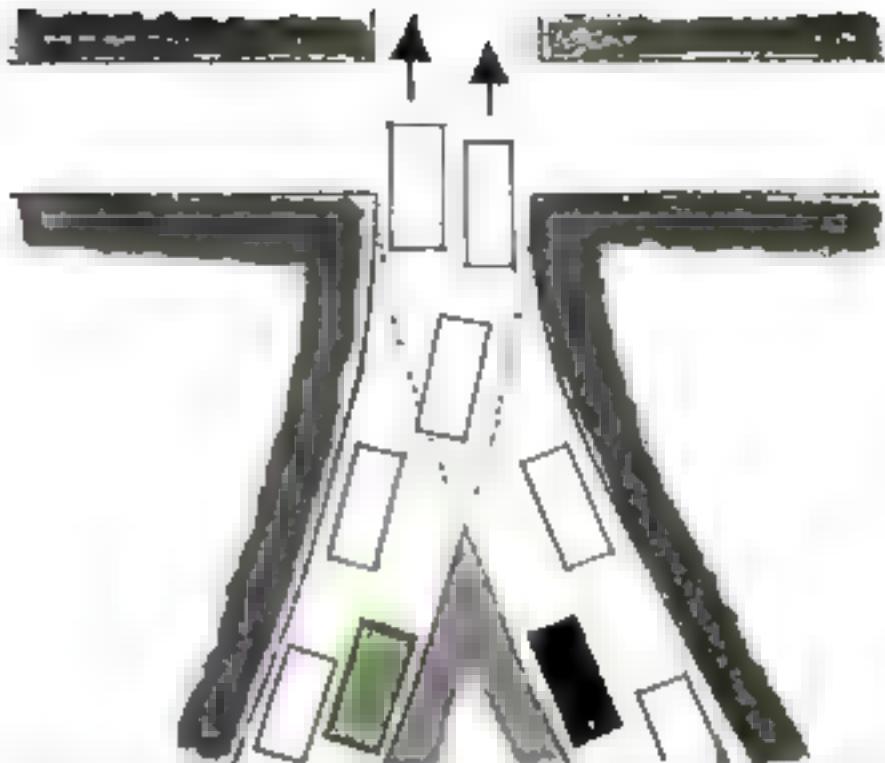
To date, of every 100 drivers tested, 66 have checked out as "highly desirable" and their subsequent records are proving the tests accurate. About 31 in

driving dilemmas?



2 **YOU ARE ON A BUSY 4-LANE ROAD.** Traffic is heavy. A bus stops and the black truck behind it signals for a left turn and starts to cut into your lane. You're in a hurry. You would—

- blow your horn and speed up to get by.
- maintain speed. You have the right-of-way.
- tap the horn but slow down "just in case."
- swing left so you won't be stalled, too.



3 **YOU ARE ON A 2-LANE, ONE-WAY ROAD** merging at a Y, no STOP sign, heavy traffic. You're in the right lane for a right turn at the next crossing. The black car starts to crowd into your lane. You would—

- blow the horn and hold speed in your lane.
- slow down and let the car cut you off.
- ease to the left until you get a break.
- signal for turn; cut right, ahead of car.

For more questions—and the answers—turn the page ►

every 100 do poorly on the tests and are shaded as "undesirable" drivers. And three are downright failures. No failures today can even breathe on an Army vehicle.

The tests work this way:

There are two groups, known as "Battery 1" and "Battery 2." All new soldiers take Battery 1. This in effect weeds out the men from the boys, so far as ability to drive safely is concerned. Those who pass then take Battery 2, which goes a step farther and shows the Army who the "superior" drivers are. Battery 2 reveals how good your coordination is, and what kind of road judgment you use.

Battery 1 starts with questions about the way you drive. Take that one about the car that stops suddenly, just ahead of you, for example. What do you do?

If you say you would slam on your brakes as hard as possible and turn left or right to miss the stopped car, your answer alerts the Army Transportation Corps' Safety Director Don Buck (a for-

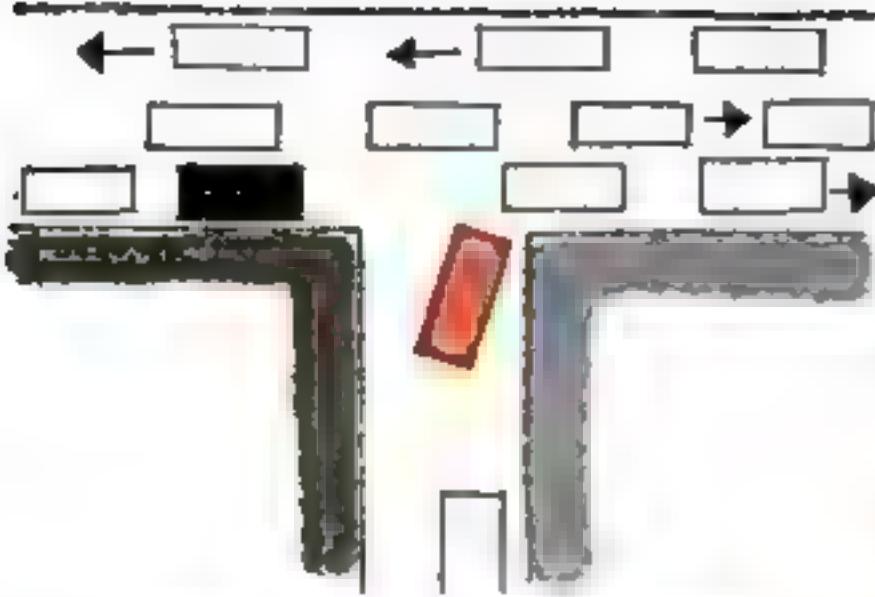
mer Indiana state trooper), to two possibilities about you:

1. You may habitually drive too close to cars ahead; and
2. You may not know that front wheels don't steer when brakes are locked.

But if you say that you would apply your brakes in a normal, straight stop, the Army knows that you customarily allow plenty of room for emergencies (in other words, you're no bumper-chaser). If you then add that you immediately throw out a lively hand signal to the fellow behind you (since your stoplights alone don't tell him how quickly you are stopping, or that you're coming to a *full stop*), then the Army knows you're a right smart driver who may someday be chauffeuring the General.

This isn't exactly how the Army asks the question, or the form in which you answer. To keep the tests secret the precise problems naturally aren't broadcast.

Next, a GI quizmaster hands you a "greased lightning" test. This is a sheet



4 **YOU'RE AT A STOP SIGN**, trying to get onto a highway. Finally you see a break in heavy traffic and start easing out. The black car blows its horn. You would—

- keep going. The other car can slow down.
- back up and wait for another chance.
- hold your position.
- cut in fast. Good drivers take advantage of all the breaks.



5 **YOU'VE JUST OVERRUN** a poorly marked expressway exit where you wanted to turn off. The next exit is two miles ahead. Traffic is heavy. You know your stop- and backup lights are okay. You would—

- park off the road until you can back up.
- shift into reverse so your backup lights go on. Then, pumping the brakes as a stop-light warning, whip your car backward fast.
- follow the former procedure, but turn on headlights, too, for added tail-light warning.
- drive on to the next expressway exit.

of paper on which are printed rows of the letter O. There are enough O's to make you dizzy. But hidden among them are a few C's

Now while someone holds a stopwatch you glance quickly at each row and count the C's. If you miss many, your eyes are the kind that might miss seeing a little frayed piece of rubber on a truck tire that could blow out just when you try to pass; or the first warning flicker of a brake light on the twentieth car ahead.

If you spot most, or all, of the elusive C's, you not only have good eyes but you're marked good on "attention to detail" and concentration.

Now the Army trotts out statements like these. You check "true" or "false."

1. "I like to build things, and the more skill or artistry required the better I like it."
2. "I don't fret too much about my problems."
3. "Other guys know they have to do what I tell them."
4. "I object to people trying to give me orders."
5. "I like to make people mad now and then."
6. "If I have a job to do, I will say frankly that I get a kick out of getting it done."

(Continued on page 240)

Here are the answers the Army's testers like

1. Continue running slowly to the next turnout. Sure, you'll ruin the tire, but that's better than running two (or more) cars. If the driver behind you is barreling along at 70 he won't be likely to see you until it's too late to stop or swerve. A patrol car can't protect a standing car in this situation any more than it can protect *use*! You'll get hustled ahead, *pronto*, if you're lucky enough to have one come along before a crash.

2. Tap your horn, but be prepared to stop in case the truck continues to pull out. The issue is not "right-of-way," but "survival." Swinging left is an invitation to the undertaker. A really considerate driver would help the truck driver to pass the bus by stopping after a proper hand signal and moving the truck into the outer lane.

3. Slow down and let the car tack in ahead of you. You'll lose perhaps two seconds, but giving a break to the other driver is *unquestionable*. It also takes less time than filling out an accident report.

4. Back up from the nose-out position if at all possible; this is not as hazardous as holding a position that crowds other vehicles trying to swerve around you. There's always a break in traffic if you'll wait for it.

5. Drive on to the next expressway exit, cross over and return to the one you missed. It won't take more than a few minutes. A car backing on a main road always looks as if it's going ahead. The driver behind may see your backup lights but he may be a slow thinker. And the fellow behind him, coming fast, may never see your lights at all.

16-Page Hi-Fi Fair

*A special section devoted to high-fidelity 1957
—the latest techniques and components that put
concert-hall music in your living room.*

The Speaker You'll Be Hearing



***The strange-looking panel above is
an electrostatic hi-fi speaker. It
works—and sounds—as different as it looks.
For a complete report, turn the page.***

Experts call the amazing electrostatic loudspeaker "a window on the studio."

By C. G. McProud

Editor, *Audio Magazine*

THE hottest development in hi-fi today is a remarkable new kind of loudspeaker, the electrostatic. It reproduces music with the utmost fidelity. It has no magnet and no cone, but works like a big condenser.

New? Well, let's go back . . .

It's 1926. You're standing in the antenna tuning shack of a high-powered radio station. Not a loudspeaker is in sight. Yet you hear the program. The source? An electrostatic speaker: the tuning capacitor, resembling a tall stack of cafeteria trays. Its plates, alternately charged and discharged by the radio signal, are alternately attracted to and repelled by each other, creating a clear, yet almost eerie sound.

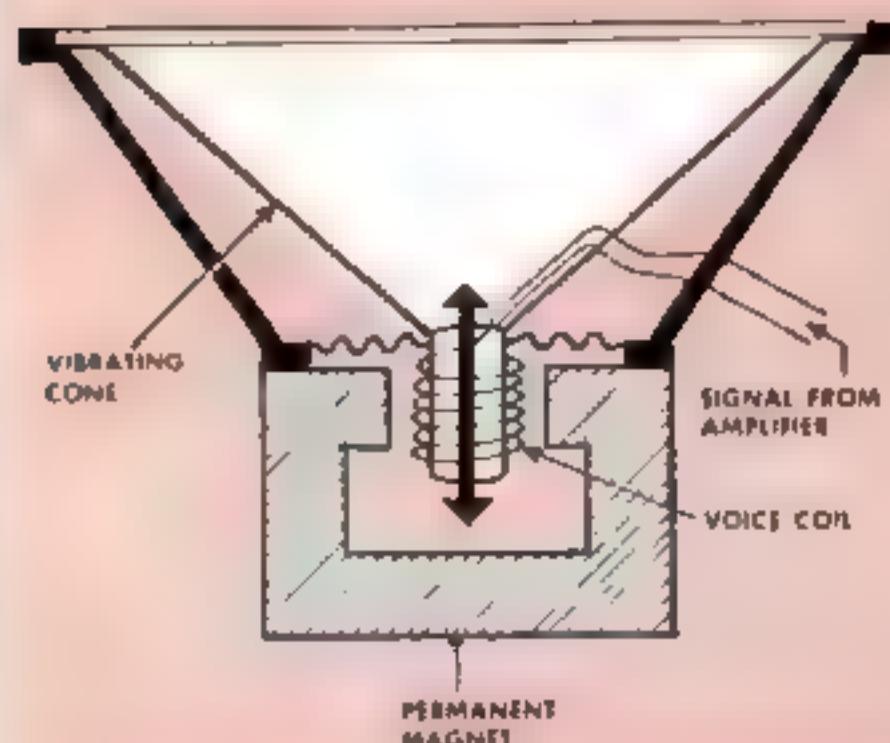
Or it's 1933. Your Peerless radio is playing along smoothly when suddenly there is a loud crack, and the sound ceases. You run down to a drugstore and get some rubber baby pants and a dozen Hershey bars. You cement the tinfoil from the chocolate bars to the rubber sheeting and install this home-made diaphragm in place of the loudspeaker's broken one. The set plays again. That's another form of electrostatic speaker.

Now you're hearing about electrostatics again. No, they're not new, yet the present versions have eliminated most of the troubles of the older ones. The diaphragms, for one thing, are now made of metal-coated plastic which can stand repeated flexing over a long life. Quality is a lot better, too, largely because of the engineering that has gone into the speakers since the Twenties.

Many hi-fi enthusiasts have contended that the loudspeaker was the bottleneck of reproduction quality. The electrostatic promises to break through that bottleneck.

Today's electrostatic speaker works on

Dynamic speaker uses magnetism



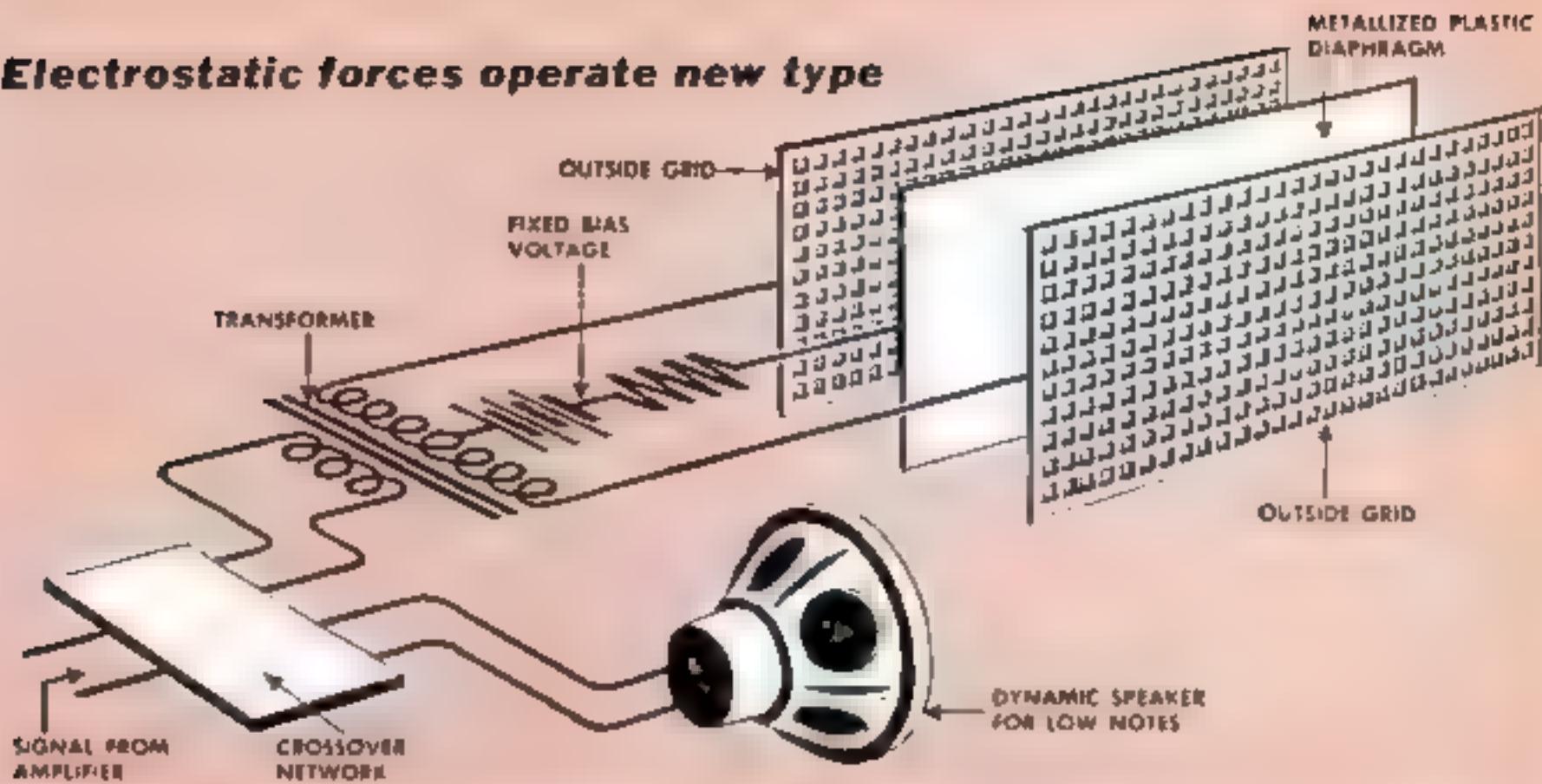
ORDINARY SPEAKER works like an electric motor. Force between signal currents in voice coil and magnetic field move cone to make sound.

exactly the same principles as those sold in Peerless radios in 1933. Basically it is a capacitor (or condenser), a brother of the device with all the semicircular plates that mesh in and out of a set of fixed plates as you tune your radio. It has two fixed electrodes, with one movable electrode—the diaphragm that produces the sound—in between.

To understand its operation, let's review some electrical theory. When two adjacent conductors have voltages applied to them, they attract each other if the voltages are of different polarity, and they repel each other if the voltages are of the same polarity. The amount of the attraction or repulsion depends on the strength of the voltage. Thus, if we consider only two plates, one connected to the positive terminal of a high-voltage source and the other to the negative terminal, the two plates will attract each other. If the voltage is varied, the amount of the attraction will vary. If one plate can vibrate, it will—in accordance with the voltage variation. If the variation is at an audio rate, the movement of the free plate will cause movement of the air around it and you hear a sound of the same audio rate.

The modern electrostatic loudspeakers have two fixed plates, which are per-

Electrostatic forces operate new type



ATTRACTION AND REPULSION of electric charges vibrate diaphragm to create sound in electrostatic speaker. A fixed voltage centers diaphragm

forated or gridlike to let the sound pass through. Between them is a plastic diaphragm—the movable plate. A steady bias voltage is applied to the diaphragm, and the audio signal is applied in push-pull, seesaw fashion, to the two fixed outside plates. The bias voltage makes the diaphragm center itself between the two outside plates when there is no audio signal. The signal, superimposed on the bias voltage, changes the attraction between the fixed plates and the movable diaphragm, causing the latter to vibrate, setting up movement of the air and creating sound waves.

While the electrostatic loudspeaker operates on a different electrical principle than the conventional dynamic, or moving-coil, speaker, it is still governed by the same laws of acoustics. To radiate low frequencies, its surface must be large. For frequencies down to 80 cycles, the surface would have to be almost six feet square. In order that the speaker may be of practical dimensions, two American electrostatic speakers are designed to reproduce only frequencies from the middle range—400 to 1,000 cycles—up. Lower frequencies are handled by a conventional dynamic "woofer." An English electrostatic is said to cover the entire audible range,

between outer grids. The signal causes the charge on one grid to push the diaphragm while the charge on the other grid pulls it.

although many who have heard it feel that it would not be acceptable to U.S. hi-fi fans

There are also electrostatic tweeters, designed to handle frequencies above about 5,000 cycles. These work on the same principle, but are neither as efficient nor as free from distortion as standard dynamic tweeters.

A principal advantage of the electrostatic speaker is that its diaphragm vibrates in the same phase throughout, since it is driven over its entire area by a uniform force. (The dynamic speaker is driven only from the center, and the entire cone does not move in phase throughout the frequency range.) Those who have heard wide-range electrostatic speakers agree that the reproduction is smooth and without any of the peaks and dips that emanate from the conventional types

Three electrostatic speakers are now on the market here. Pickering and Company, Inc., Oceanside, N. Y. offer two models. One reproduces frequencies from 1,000 cycles up, and measures 15 by 22 by six inches. The radiating element is only about two inches thick, but it is curved and mounts on a base six inches deep. The larger model starts at 400 cycles per second, and measures 22 by

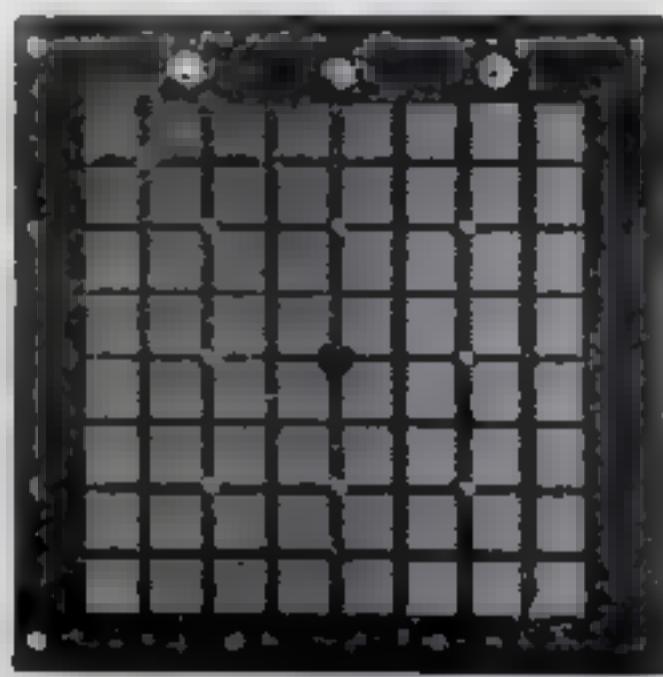


RESEMBLING A FIREPLACE SCREEN, British-made Acoustical speaker is said to reproduce all audible frequencies. American models do not.

36 by 8½ inches. Both models reproduce sound efficiently up to 35,000 cycles, far higher than people can hear. The Pickering models sell at \$150 and \$210 respectively.

Janszen Laboratory, Inc., Cambridge, Mass., employs a radically different form of construction. Its speaker is composed of four separate units mounted together in a cabinet so as to provide a wide distribution angle. Each unit consists of two plastic and wire grilles about eight inches square—the fixed plates—with the diaphragm cemented between them. This model covers the range from 500 cycles upward and costs \$184.

Most hi-fi amplifiers are designed to match the low impedances of dynamic speakers: four, eight or 16 ohms. The electrostatic has a much higher impedance. One Pickering model, for example, has an impedance of 170,000 ohms (at 1,000 cycles). This necessitates the use of a transformer to match the impedances. At the same time, the bias voltage must be supplied, and a crossover network must be provided. Both Pickering and Janszen supply these extra components as part of their speaker assemblies, and they can be connected to an amplifier almost as simply as dynamic speakers. It is necessary to provide an AC outlet for the bias supply; loud-



PLASTIC RECTANGLE makes one section—four work together—of Janszen speaker. Other American electrostatic, Pickering, is on page 185.

speakers located far from the amplifier may require some additional wiring if both are turned on at the same switch.

The impedance of the electrostatic speaker is almost entirely capacitive: .001 to .0025 microfarads at the input terminals. When the high impedance of the speaker is matched to the amplifier, the effective capacitance of the speaker is transformed to perhaps two or three microfarads. This may cause oscillation in some amplifiers which are not designed to work with loads of high capacitance. However, many amplifiers will work perfectly with a capacitive load, and the combination of a good amplifier and a wide-range electrostatic speaker can result in the finest quality of reproduction.

The electrostatic speaker promises still more in the future. P. J. Walker of Acoustical Manufacturing Co., the first British manufacturer to introduce an electrostatic unit, believes that we may expect excellent full-range results from a 15-inch-wide panel to be installed in the wall between two studs. Such a unit may be as high as six feet, and could radiate equally into the two rooms on each side of the partition. Another possibility is that the unit might be installed in the ceiling, giving a uniform sound pattern throughout the room. **END**

It takes more than a string of good components to play your records faithfully. You'll get more music and less noise if you follow these . . .

FAIR

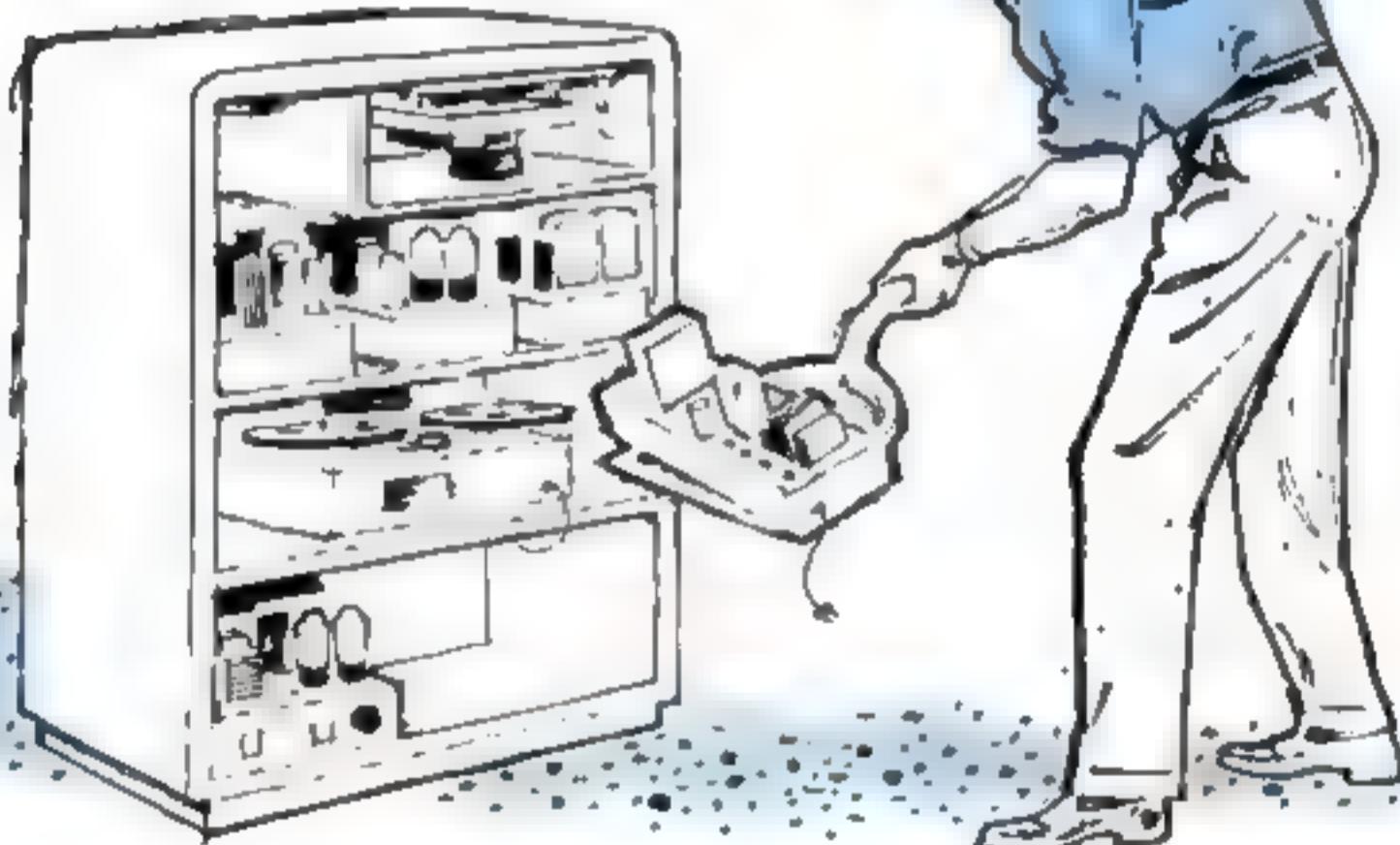
DO's and DON'Ts of Hi-Fi

By Matthew Mandl

SO YOU'VE sunk a couple of hundred bucks into fancy hi-fi components. You conscientiously wired them together. Now you're playing records. Is it like a seat inside Carnegie Hall? Or does it sound more like the bus stop outside it?

Usually the components are okay—or were when you bought them. Most dis-

appointments come from faulty installation or maintenance. If you want to hear the fine music that the individual parts are capable of reproducing, you have to pay as much attention to your part of the job as the component engineers do to theirs. The fixes are usually easier than you might think. Here are some of the things you should—and should not—do to enjoy that "seat inside the hall."

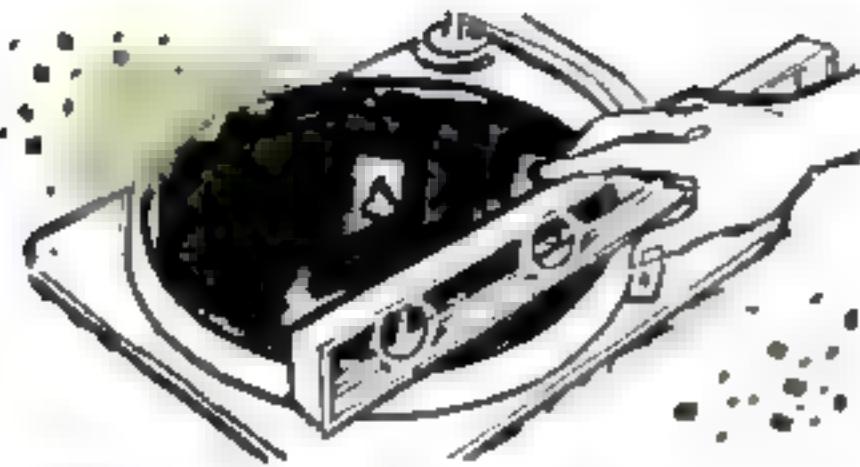


DON'T

crowd components. Heat from power supply and amplifier tubes may overheat the turntable motor, make your FM tuner drift, or cause trouble in the amplifier itself. If you must house the amplifier near other units, ventilate its cabinet so that heat goes outside, not into adjacent compartments. One good dodge that you can use is a metal sheet, installed over the amplifier and bent so that the heat is channeled outward.

Turn the page for more Hi-Fi Do's and Don'ts

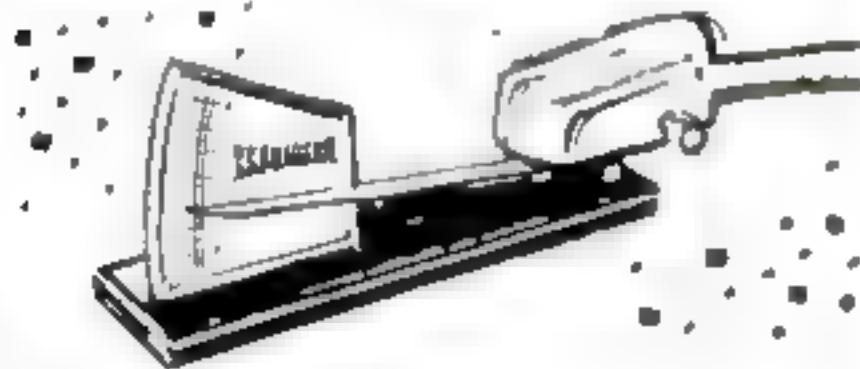
OCTOBER 1956 169



DO level the turntable. Just a slight tilt makes the needle press unevenly against the sides of the grooves. As a result, the record wears rapidly and the sound is distorted.

Use a carpenter's level to get the turntable itself—never mind the turntable housing—absolutely true.

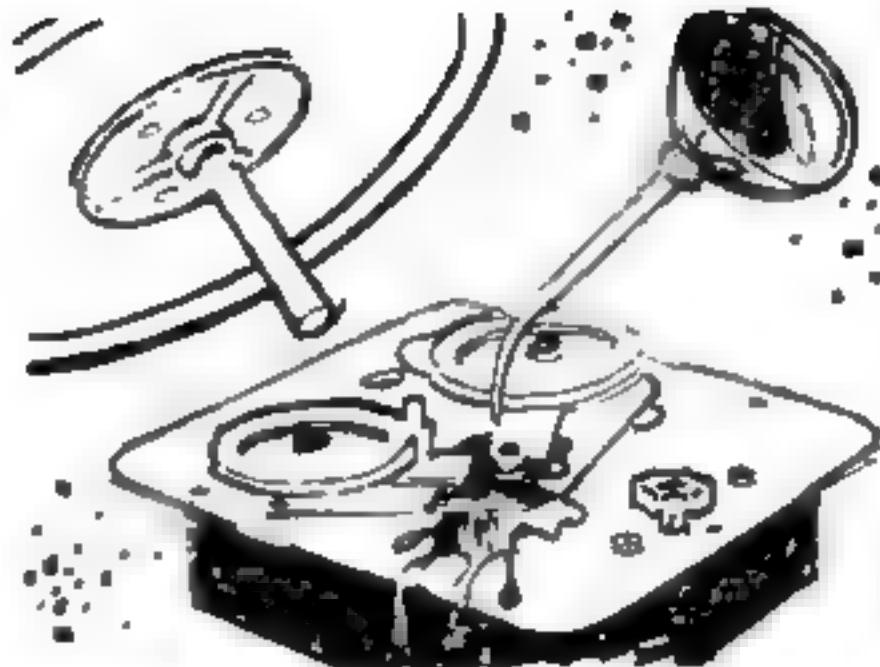
DO use the right cable. If your amplifier is more than a few feet from the turntable, the connection should be coaxial cable such as RG11/U or RG59/U. These types have widely spaced conductors with plastic insulation between to minimize losses in high-frequency tones.



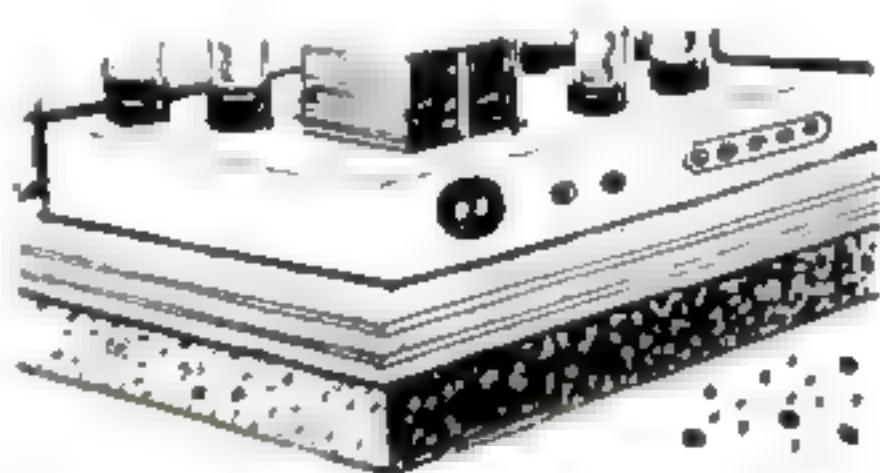
DON'T guess at stylus force. If the needle (technically it's a stylus) presses down on the record too lightly or too heavily, you'll have trouble with frequency response, compliance and record wear. It's best to use a gauge—they're inexpensive—and measure the actual force that is exerted by the stylus.

For magnetic cartridges, it should be from six to eight grams; for ceramic cartridges, from seven to nine grams.

DO check needle wear. When high-pitched tones come out fuzzy and distorted, the fault is often the needle. Try a new one, or have a dealer inspect your old one. Keep your stylus clean, and throw away badly worn records—they'll harm even a diamond stylus.



DON'T over-lubricate your motor and turntable. Be particularly careful to keep oil and grease away from rubber-tired idler rollers. Check lubrication at least once a year, using the amount and type of oil or grease that is recommended by the manufacturer.



DO cushion the amplifier. Use a foam-rubber pad topped with $\frac{1}{8}$ " plywood. This will keep turntable vibration, transmitted by the cabinet structure, from making amplifier tubes act like microphones. It will also help to prevent the vibration of transformers and chokes from reaching the pickup.

DON'T make the turntable suspension too soft. If it is too springy and undamped, the entire base may vibrate sympathetically with the motor. This will increase distortion and low-pitched rumble. Strips of felt rolled to fit snugly inside the suspension springs will usually have the effect of damping out such unwanted sympathetic vibration.



DO watch out for hum. The 60-cycle magnetic field generated by the power-supply transformer may induce a hum in audio-signal cables or a magnetic cartridge. The hum will be amplified along with the music. So keep the transformer as far as you possibly can from the cables and cartridge.

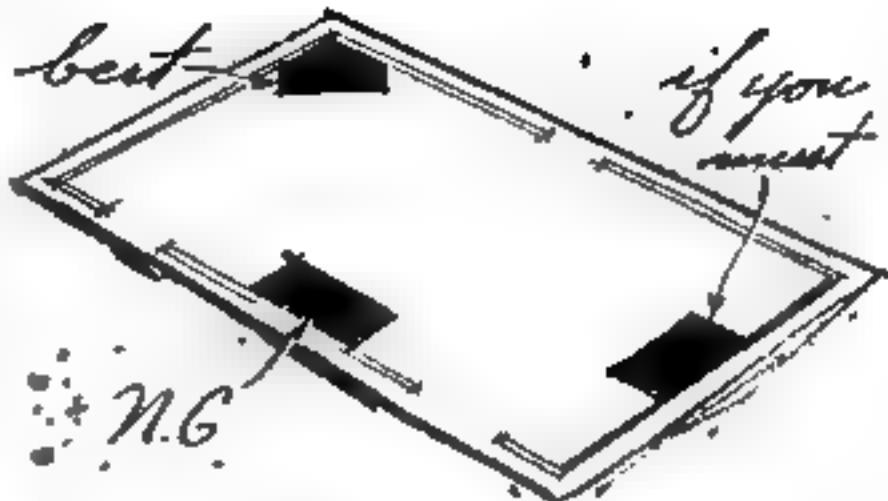
The chassis of the amplifier, turntable and tuner should also be carefully grounded with heavy wire. Reversing the power plugs of turntable and amplifier may help to kill hum, too.

DON'T skimp on cabinet space. Provide enough room so that you can get at all the units, and allow extra space for bigger components that you may install later on, such as a speaker or amplifier. A stationary installation is best for the turntable. If you must mount it in a drawer, don't open or close the drawer until you are sure the pickup is in its rest position—not on a record.

DO free the drive idler when your turntable is not in use. Most modern turntables release idler pressure automatically when you turn the turntable switch off. But some people plug the turntable into the switched outlet on the amplifier, and leave the turntable switch permanently on. Sustained pressure on the idler tire produces flat spots which cause audible thumps each time the idler goes around.

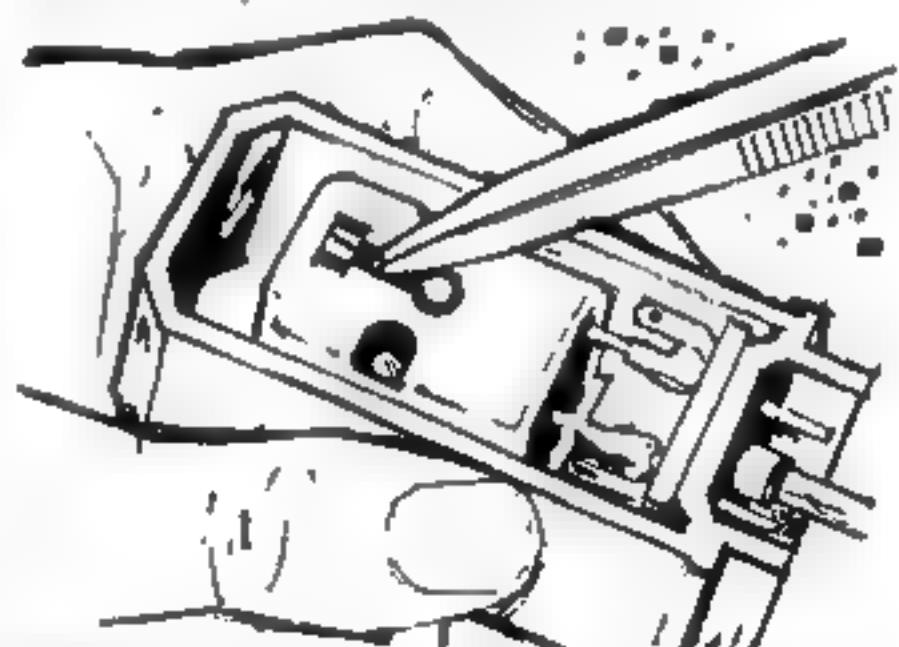
If you have a record-changer that does not release idler pressure automatically, it is a good idea to lift the turntable platter off the spindle when you expect that the machine will be left unused for any length of time.

DON'T rub your records with a dry cloth or brush to clean them. This not only scratches the surface but builds up a static charge that attracts dust. Use a soft, damp cloth or sponge and wipe very gently with the grooves—never across them. Commercial anti-static solutions, which reduce the tendency of records to collect dust, are effective but should be used very sparingly.



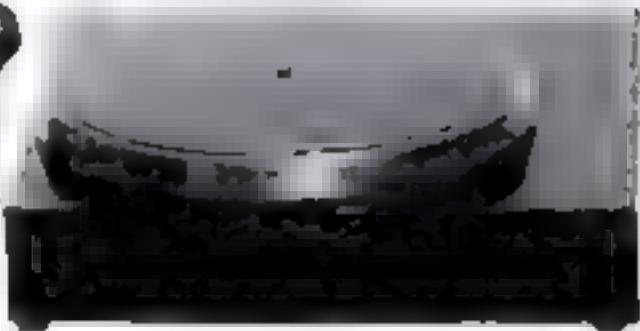
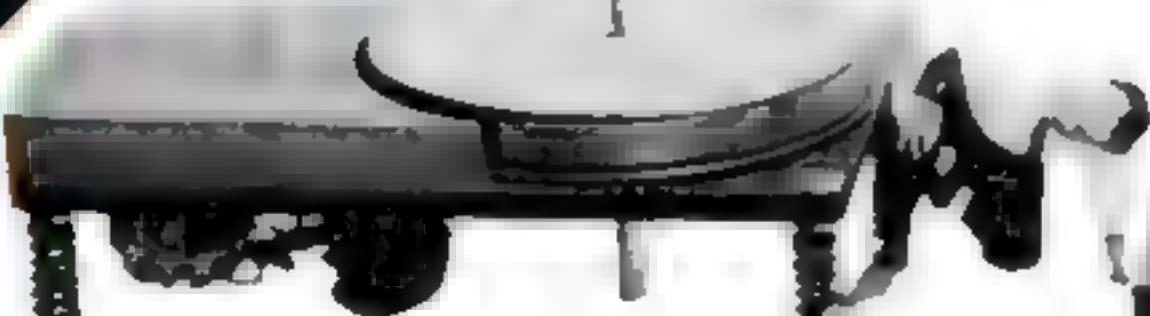
DON'T forget the furniture. Room arrangement makes a big difference in the way the music sounds. For the best effect, place chairs as far from the speakers as you can. Don't put big sound-soakers, such as overstuffed furniture, right in front of the speakers. Try to place the speakers so that they aim along the longest dimension of the room. A corner location is best, an end is second choice and a side least desirable.

DO check tubes. Vacuum tubes change with use and should be tested once or twice a year. Among the most frequent offenders are the two identical tubes in the push-pull output stage of the amplifier. If one of this pair of tubes ages more than the other, the circuit will be unbalanced and the sound will be distorted. Some amplifiers have a control that lets you rebalance them.



DO keep the stylus properly centered between the pole pieces of the cartridge. If you use a variable-reluctance cartridge, periodically check the vane holding the stylus. With a pair of tweezers, extreme care and a considerable amount of patience, you can nudge it back into correct alignment.

END



COMPONENTS PROFESSIONAL

COMPONENTS Jr.



THORENS

BOGEN



METZNEK STARLIGHT



PRESTO PIROUETTE



REK-O-CUT RONDINE Jr.

How to Choose

The machine that spins the records is basic to hi-fi. Should it be light or heavy? Belt- or gear-driven? Here's the low-down.

SO WHAT'S so hard about making a record go 'round and 'round? That's all a hi-fi turntable has to do. You need a motor and a drive train.

Yep. But what a motor and drive train!

If the turntable is noisy, you hear it with the music. If it shakes, you hear that, too—it vibrates the needle the same way the recorded music does. If its speed

varies, the music wanders off pitch—remember what happens to a hand-wound phonograph when its motor runs down?

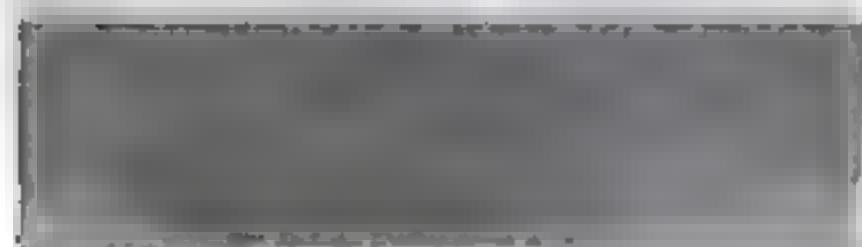
Look under that spinning record, if you've got a good turntable, and you'll see a real piece of machinery—soundless, steady, constant—an eye-opener to design and workmanship. That's what it takes to reproduce true music for you.



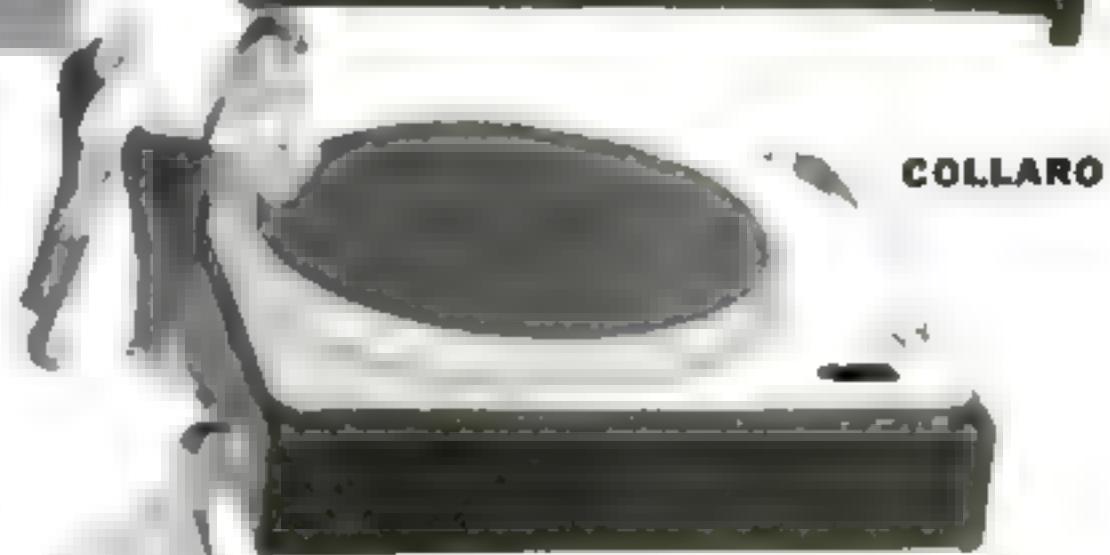
FAIRCHILD
TURROMATIC



GARRARD 301



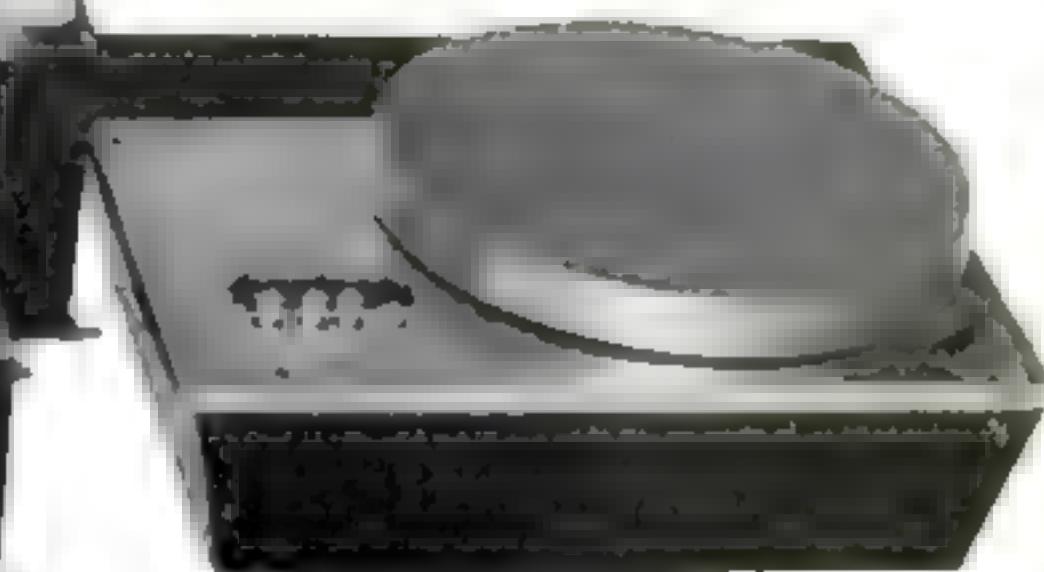
ELECTROACUSTIC



COLLARO



REK-O-CUT RONDINE DELUXE



H. H. SCOTT "710"

the Right Turntable

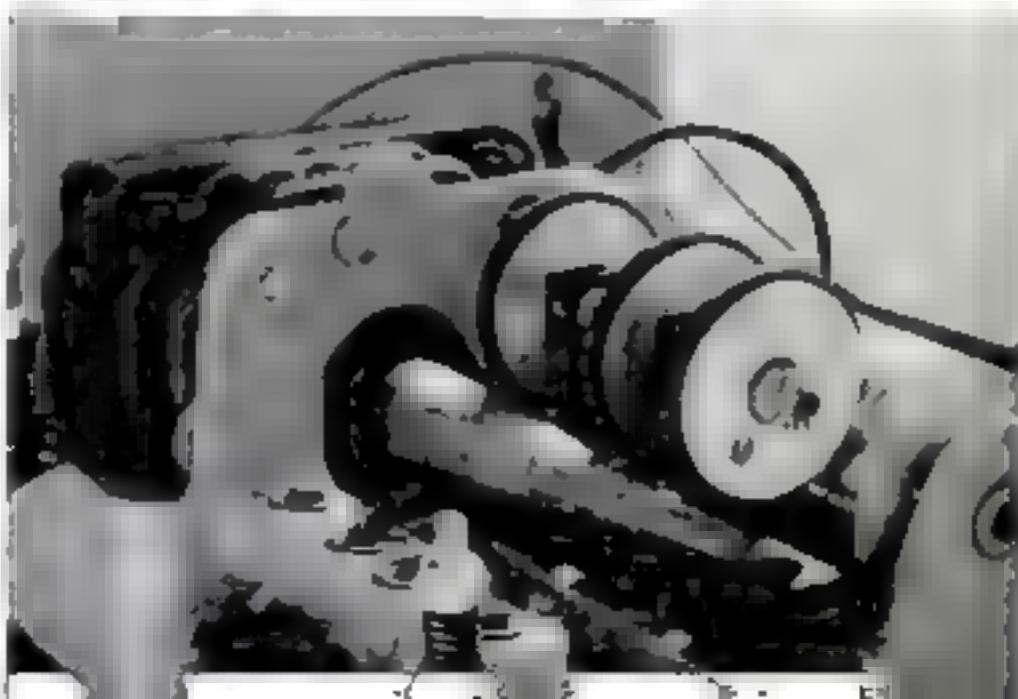
Engineers have names for noises that no respectable turntable causes. The names mean what they sound like.

Wow is a change in pitch caused by a variation in the speed of the turntable. You hear the note start right, dip in pitch, then go back up again each time the turntable revolves once.

Flutter is a faster wow. The change in pitch occurs several times during each revolution of the record.

Rumble is a low growl generated by

PUSH-BUTTON SHIFT changes speed on Scott turntable. Button presses one of three idlers against conical motor shaft. Diameter of the shaft at that point determines the speed reduction.



vibration from the motor or drive train.

How to eliminate them. There are three basic ways:

1. Use turntable disks so heavy that they are practically immune to vibration or momentary changes in driving speed.

2. Machine and balance motors so meticulously that lighter disks and simple drive trains will do.

3. Use elaborate mechanical isolation to keep vibration from reaching the turntable disk.

Naturally, all manufacturers work all three of the angles, but with varying emphasis on each one.

What's the difference? The reasons for the variety of turntable designs may help you select the one you want.

PS took apart and analyzed 13 qual-

ity turntables that are now available in the U.S. (see chart below). They are all manual players—none has a record changer. The first four listed come with tone arms and cartridges; the remainder are professional types and do not. Here's how they stack up.

Turntable disk. Weight varies all the way from $1\frac{1}{2}$ to $25\frac{1}{2}$ pounds. There is no question that a heavier turntable smooths out speed fluctuations and resists vibration, but the added weight brings other problems: slow starting, the need for more muscle in the power train, and the difficulty of packaging the machinery attractively and conveniently.

Any disk—light or heavy—made of iron or steel will attract a magnetic pickup. To avoid that, a "spacer," a cover or extra-thick mat of non-magnetic material, is usually found on a ferrous disk.

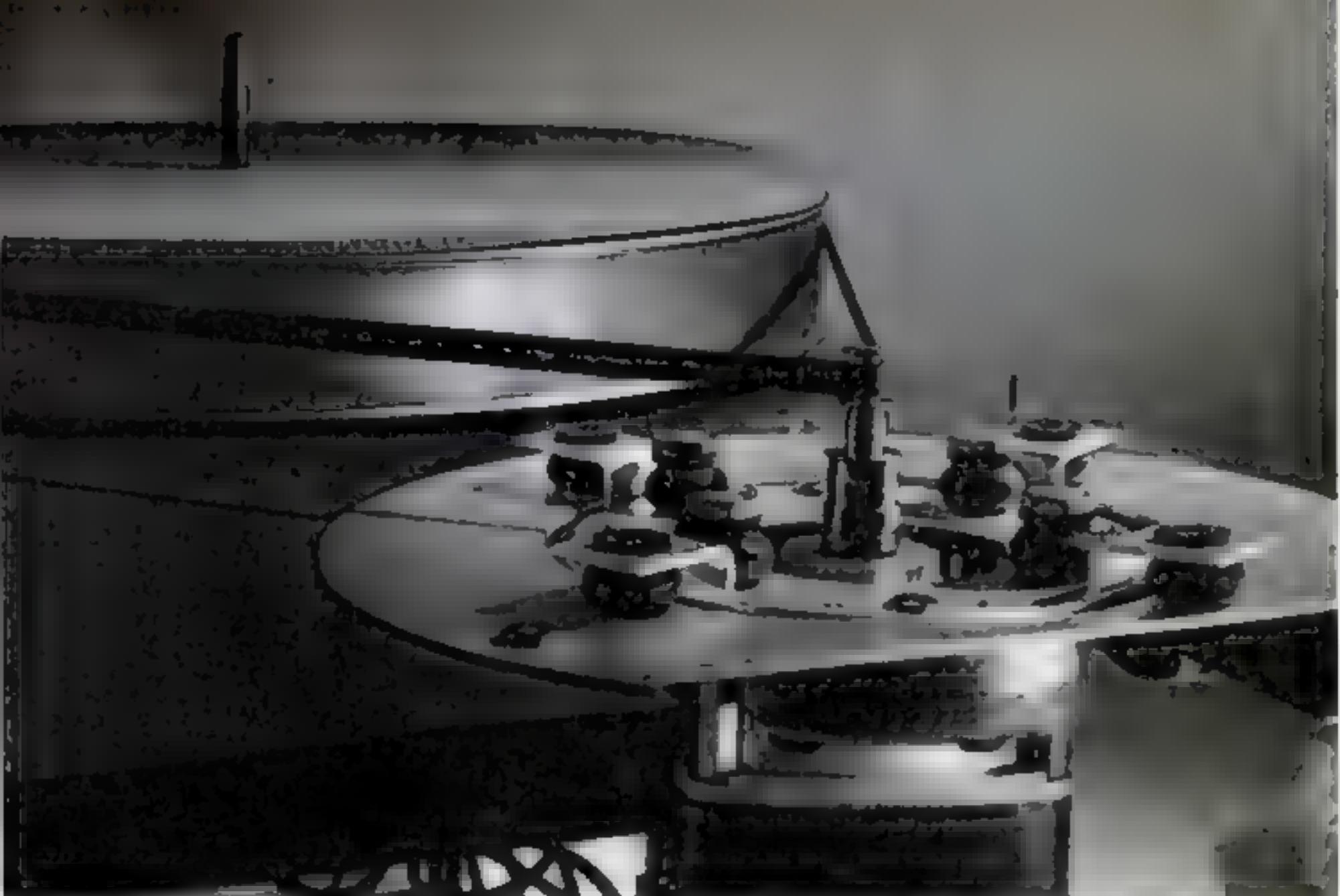
Motor type. The four-pole induction motor is standard equipment on every turntable except one. The four poles give four torque "kicks" to the armature in each revolution, providing smooth power with a minimum of flutter or wow. This

HI-FI TURNTABLE 'SPECS'

MAKE	APPROXIMATE PRICE	WEIGHT (LB.) ^a	TURNTABLE MATERIAL	MAT MATERIAL	MOTOR	MAIN BEARING
ELECTROACUSTIC	\$37.50 ^b	1 $\frac{1}{2}$	pressed steel	ribbed rubber	4-pole, vertical mount	5/16" x 1 $\frac{1}{2}$ " in brass
BOGEN	40.40 ^b	3 $\frac{1}{2}$	pressed steel	ribbed rubber	4-pole, horizontal mount	5/16" x 1 $\frac{1}{2}$ " in brass
COLLARD	52.00 ^b	8 $\frac{1}{2}$	non-magnetic alloy	ribbed rubber	4-pole, vertical mount	7/16" x 2 $\frac{1}{2}$ " in bronze
THORENS	59.95 ^b	12 $\frac{1}{2}$	pressed steel	felt	4-pole, horizontal mount	5/16" x 9/32" in brass
COMPONENTS Jr.	39.50 ^c	5	ceramic flywheel, aluminum cover	cork	4-pole, vertical mount	5/16" x 2 $\frac{1}{2}$ " in nylon
METZNER STARLIGHT	49.50 ^c	3 $\frac{1}{2}$	machined aluminum	cork	4-pole horizontal mount	not available
REK-O-CUT Rondine Jr.	49.95 ^c	4 $\frac{1}{2}$	machined aluminum	ribbed rubber	4-pole, vertical mount	5/16" x 2 $\frac{1}{2}$ " in cast iron
PRESTO PIROUETTE	66.00 ^c	4 $\frac{1}{2}$	machined aluminum	smooth rubber	4-pole, vertical mount	5/16" x 2" in bronze
REK-O-CUT Rondine DeLuxe	79.95 ^c	4 $\frac{1}{2}$	machined aluminum	ribbed rubber	4-pole, vertical mount	5/16" x 2 $\frac{1}{2}$ " in cast iron
GARRARD 301	87.50 ^c	6 $\frac{1}{2}$	non-magnetic alloy	ribbed rubber	4-pole, vertical mount	5/16" x 3 $\frac{1}{2}$ " in bronze
COMPONENTS Professional	99.50 ^c	25 $\frac{1}{2}$	machined cast iron	cork	2 phase capacitor-induction, vertical	5/16" x 4" in nylon
FAIRCHILD TURROMATIC	99.50 ^c	14	cast-iron flywheel, aluminum cover	plastic foam	4-pole, vertical mount	5/16" x 3 $\frac{1}{2}$ " in Babbitt
H. H. SCOTT "710"	125.00 ^c	3 $\frac{1}{2}$	machined aluminum	neoprene-cork	4-pole, horizontal mount	5/16" x 2" in bronze

NOTES: ^aEffective rotating weight

^bPrice includes tone arm and plug-in head



RUGGED SIMPLICITY distinguishes the top-grade Components Professional. It has a heavy turntable disk driven directly by a single belt. To change speeds for different records you move the belt with your fingers from one pulley step

to another. Vibration from motor (foreground) is effectively isolated by double suspension scheme. The motor, floating on rubber, hangs from a metal ring, and the ring itself is floated off the turntable base on rubber.

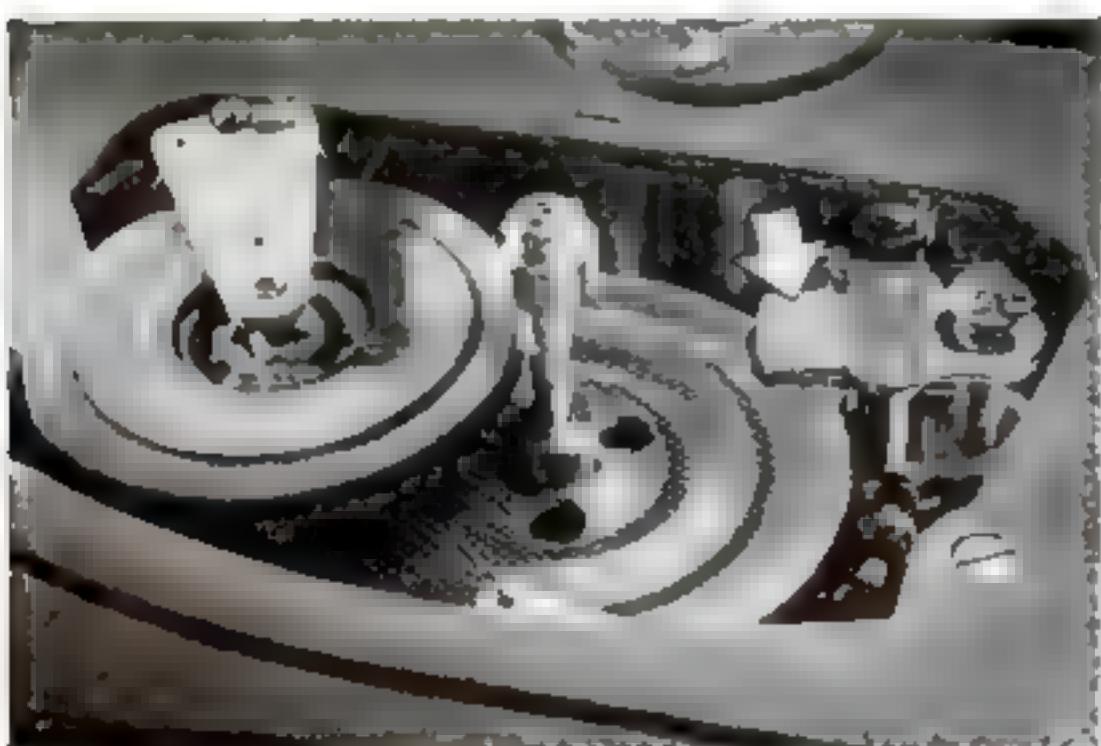
SPEED REDUCTION DRIVE	FINAL DRIVE	SPEED-CHANGE CONTROL	FINE SPEED ADJUSTMENT	COMMENTS
stepped pulley	Idler to rim	knob	none	
cone pulley	Idler to turntable bottom	lever	continuously variable, 16-80 r.p.m.	speed control has adjustable stops for 33½, 45 and 78 r.p.m.
stepped pulley	Idler to rim	knob	none	
gearshift	center drive	knob	± 5%	motor and drive completely enclosed integral unit
direct belt drive to	outside rim of flywheel	hand-shifted pulleys	none	comes with 33½-r.p.m. pulley; 16-, 45- and 78-r.p.m. pulleys available
worm gear	friction disk to knurled pulley on main turntable shaft	lever	continuously variable, 16-80 r.p.m.	motor and drive completely enclosed integral unit, built-in stroboscopic tachometer
stepped pulley	Idler to rim	lever with lock nut	none	available for 33½ and 45 r.p.m., or 33½ and 78 r.p.m.
stepped pulley	Idler to rim	shifting plate with ball detent	none	
stepped pulley	Idler to rim	knob	none	has "on" pilot light
stepped pulley	Idler to rim	lever	± 3%	fine-speed adjustment is an eddy-current brake
stepped pulley	belt to outside rim of turntable	hand-shifted belt	none	4-stepped pulley available for 16, 33½, 45 and 78 r.p.m.
motor pulley to idler	then belt to rim of flywheel	knob	none	has "on" pilot light; solenoid in drive permits remote control
cone pulley to idler	nylon worm gear, center drive	push button	± 5%	built-in stroboscopic tachometer

*Price does not include tone arm

• Hysteresis synchronous motor available



KNOB SWITCHES SPEED on Fairechild model by changing the idler-pulley between the motor shaft and the drive belt. The three idlers, mounted on a turret, are all the same diameter. But the pulleys fixed to the idlers are of different diameters to drive the belt at different rates.



ELECTRIC BRAKE for fine speed adjustment is unique with Garrard. Permanent magnet (arrow) induces electric current in aluminum disk on motor shaft, and current creates a magnetic field opposing that of the permanent magnet. The magnet can be moved to adjust this braking effect.



DRIVE TURNS A CORNER—without gears—in ingeniously designed Bogen. Motor shaft, horizontal to lessen effect of vibration, must spin horizontal turntable disk. So big idler wheel bears against the motor shaft and underside of disk. Position of the idler along conical shaft sets the speed.

type of motor also radiates less of the magnetic field that sometimes causes an audible hum with a magnetic pickup.

For still smoother power, some makers offer an optional hysteresis synchronous motor (about \$50 extra). This type may have as many as 24 poles and gives almost continuous torque impulses to the armature.

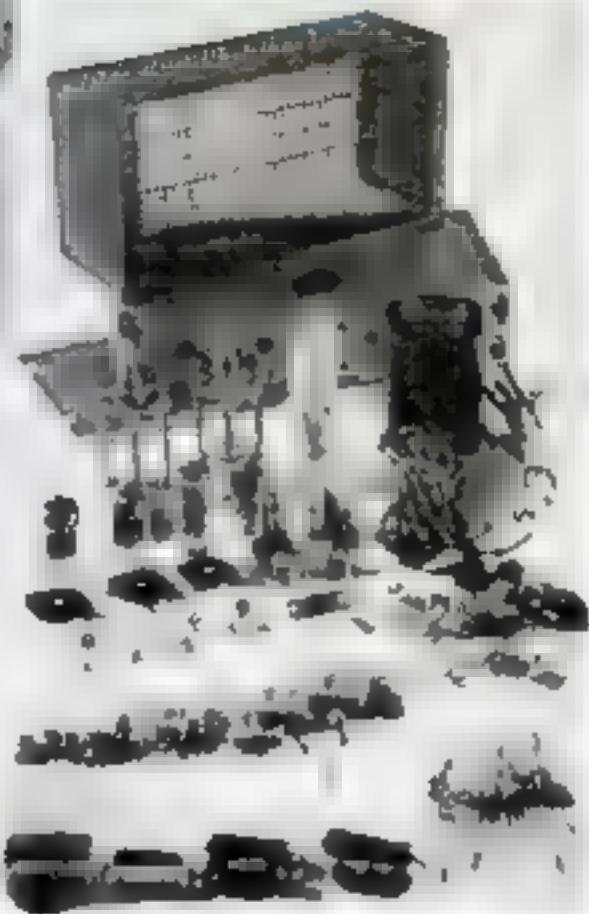
The dissenter among turntables is the Components Professional. It uses a two-phase capacitor induction motor, specially designed to maintain constant speed with its heavy, belt-driven disk.

Motor mount. The turntable shaft is vertical, and it can be driven most simply by a motor mounted with its shaft also vertical. But there's a big but. The most serious source of vibration noise (rumble) is the rapidly spinning motor armature. It shakes at right angles to its shaft. If the motor shaft is vertical, the motor vibrations are mainly horizontal. And horizontal vibration is what you don't want, for the phonograph stylus has to be very sensitive to it—that's the way the recorded music shakes it. The stylus is less sensitive to vertical vibrations.

A motor mounted horizontally—the armature vibrations are then vertical—should be quieter. But you now need extra gears or idlers in the drive train to make the power turn the right angle to spin the turntable's vertical shaft. And these additions may increase cost and noise.

Drive train. The old-fashioned, simple belt drive seems to be returning to favor with

[Continued on page 274]



New Unit Makes Speakers Sound Better

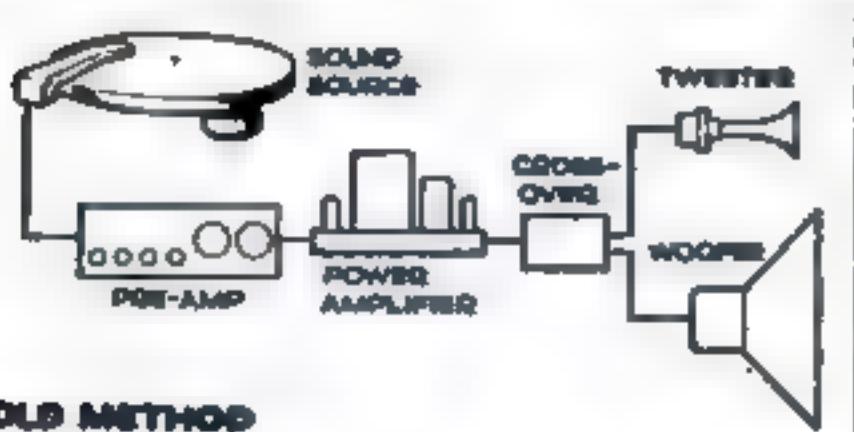
THE newest addition to the hi-fi arsenal is an electronic crossover to separate high notes from low ones. It gives much greater control over the sound produced by a particular woofer-tweeter speaker system: You can adjust the frequency at which the woofer stops working and the tweeters begin, and you can control their volumes independently.

The unit, available as a kit, is used with two separate amplifiers—one connected to the woofer, one to the tweeter.

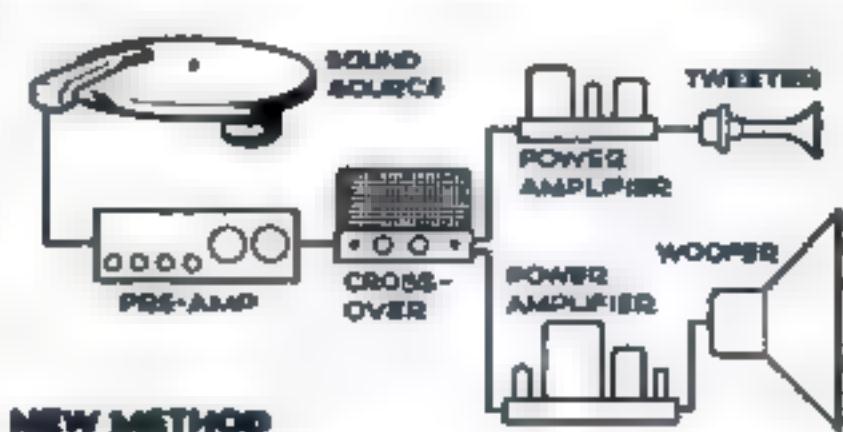
This arrangement lets you use simpler amplifiers designed for the frequencies that they will handle. Separate amplifiers also reduce distortion caused by interaction between high and low frequencies.

The electronic crossover contains two tubes (plus a rectifier) arranged to form two adjustable filters, one passing high frequencies, the other lows. It neither amplifies nor causes any loss in the signal strength. The Heath Co., Benton Harbor, Mich., puts out the kit.

How electronic crossover works through two amplifiers



OLD METHOD sends signal to wide-band amplifier that must be able to handle all audible frequencies. Output from amplifier is then divided by crossover network to feed the speakers.



ELECTRONIC CROSSOVER divides signal ahead of power amplifier, avoiding loss of power. The separate frequencies go to individual amplifiers, which drive the speakers directly.

FAIR

Cabinet from a Kit

Enclosures that you can assemble



START WITH A SCHEMATIC ARRANGEMENT of parts, and you'll know what goes where when you assemble your speaker enclosure. Baffle

blocks supplied with this University kit let you plug the mid-range horn and tweeter holes if you start your speaker system with a single cone.

ASSEMBLY BEGINS with the base. Like all good kits, this one is assembled with wood screws. All hardware, including corner cleats to draw the angled base sections together, were supplied with the kit—plus a can of cabinetmaker's glue, a tube of wood filler, and sandpaper. This kit came with some plywood edges that had already been covered with hardwood veneer.



Improves Your Speaker

bring out hidden tone quality you never dreamed was there.

By Henry B. Comstock

STARTING after breakfast some Saturday morning, you can assemble a scientifically engineered and handsome hi-fi speaker cabinet in time for an evening of full-toned Bach, Beethoven or bebop.

You can do it with no more electronic equipment than a hammer, a screwdriver and one of the many speaker-enclosure kits now being sold by mail and at audio supply stores.* These kits range in price from \$24 for a knock-down portable horn, to \$120 for a big three-speaker job that comes fully assembled but unfinished. Pre-cut parts and simple, step-by-step instructions make most kits a breeze to put together.

Practically all do-it-yourself enclosures come without the speaker system. This makes sense, because a really fine set of speakers, along with a crossover network to shove the right notes into each, is a sizable investment. If you are on a hi-fi budget you may want to buy the speakers piecemeal, and with a speakerless enclosure kit you can. You can even make a modest start by blocking off all but one of the pre-cut holes in the baffle and temporarily installing the speaker from your present console radio or phonograph. Mounted in its new housing, the old cone will pump out sweeter audio than you ever thought possible.

What kit to buy. Despite the technical jargon that kit manufacturers use to describe their products, all speaker enclosures have one prime purpose—to enhance the quality and power of the sound waves that are pumped off the

low frequency speaker cone, or "woofer." They are a working part of the sound system—not just pretty furniture.

The variety of ways by which enclosures improve speaker performance are not as important to you as your choice of the right type for the room in which you plan to use it.

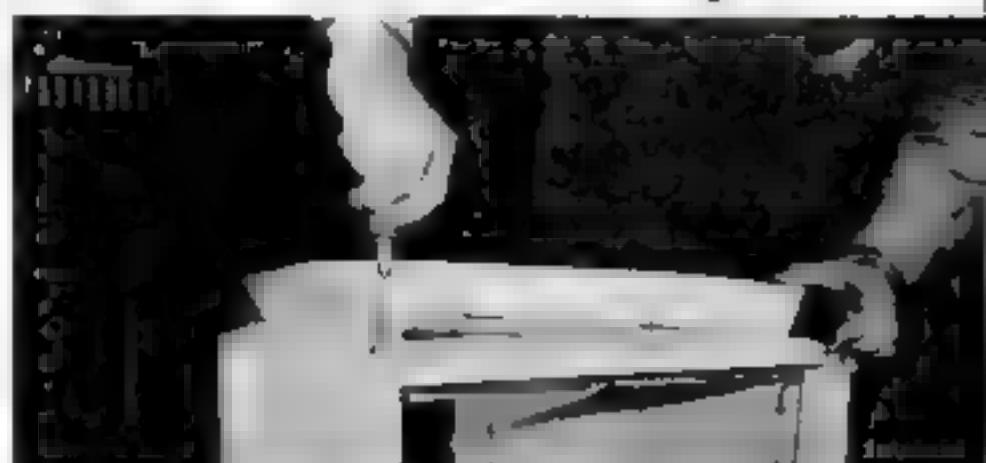
Best for a small room is one of the so-called "miniatures," technically a ducted-port bass reflex. Small enough to set on a bookshelf, one of these mighty mites produces surprisingly rich clear tones.

If the sound waves are to fill a large

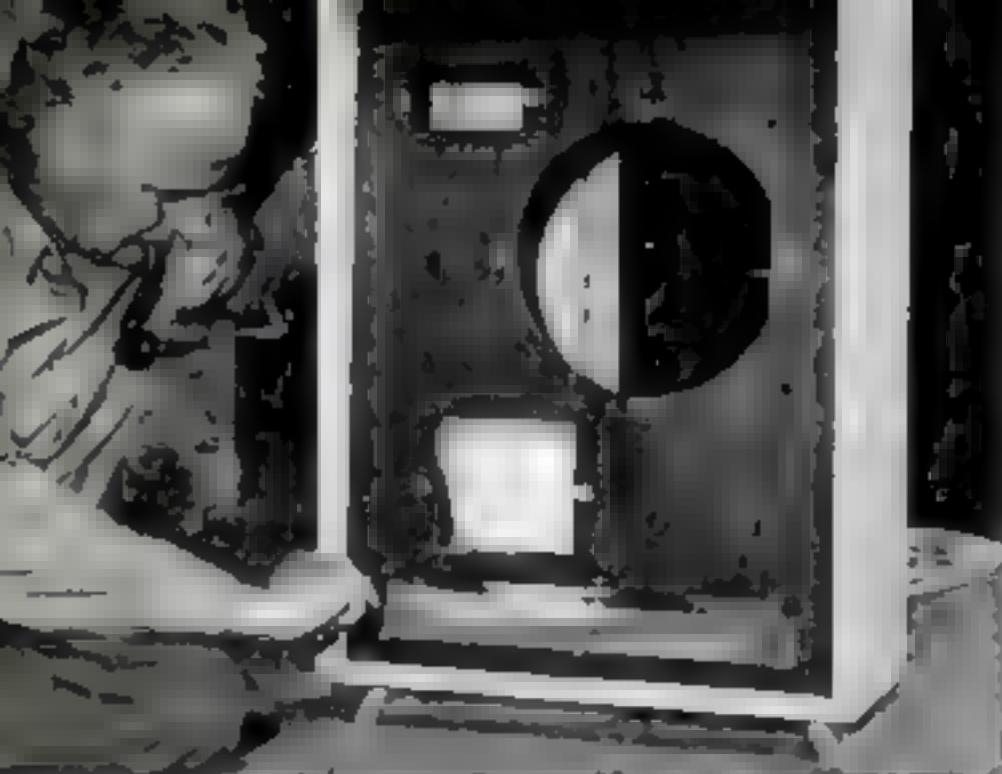


REINFORCING CORNER STRIPS fit into grooves for accurate alignment. Wood screws were furnished in three lengths. Choosing the right size screw for each anchoring job is important. Otherwise they'll break through the veneer.

SPOT ALL WOOD SCREWS before sinking the first one, and you will have no aligning troubles when you fasten down members like this base assembly. With accurately milled parts, you don't have to check corners with a square.



*Among manufacturers producing hi-fi speaker-enclosure kits are: British Industries Corp., 80 Shore Rd., Port Washington, N.Y.; Electro-Voice Inc., Buchanan, Mich.; G & H Wood Products, Cabinet Div., 99 N. 11th St., Brooklyn 11, N.Y.; Heath Co., 305 Territorial Rd., Benton Harbor, Mich.; Carlson Associates, 1379 E. 15th St., Brooklyn 30, N.Y.; and University Loudspeakers Inc., 80 S. Kensico Ave., White Plains, N.Y.



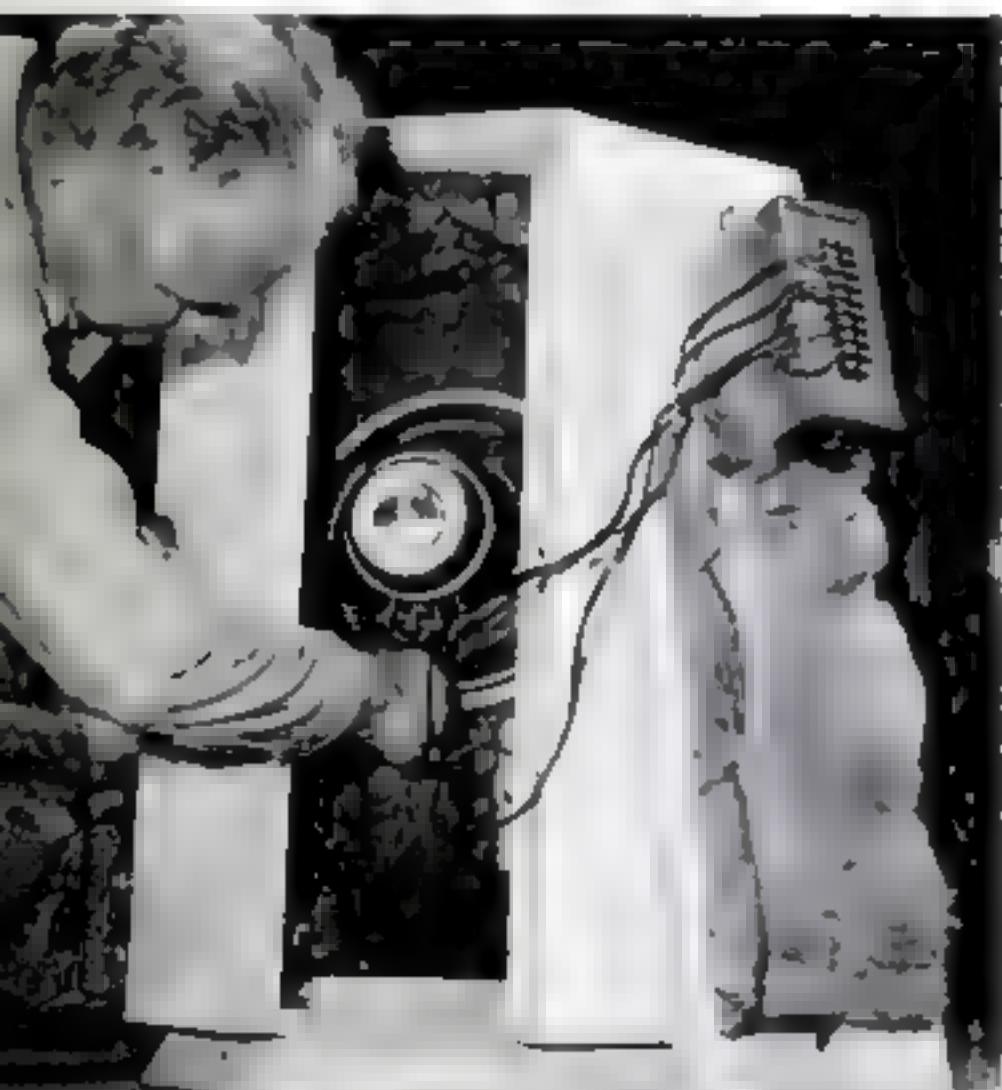
IMPROVISE, IF YOU LIKE. Instructions said to tack grille cloth to the baffle edges, then screw the baffle in place from the rear. It's easier to drive the screws from the front, and then attach the grille cloth with edge molding.

room, a folded-horn enclosure is a good bet. Backed against two abutting walls, it will use them as a part of the horn-system, literally putting you "inside the horn." No corner available? Then go for a large bass-reflex or cornerless-corner enclosure, which can be used against a flat wall.

What you get. No matter which type you choose, you'll find:

- A properly designed box, engineered to make your speakers sound right.
- Accurately cut wood parts—usually

SPEAKER UNITS ARE MOUNTED through the rear panel opening. The crossover network for this three-speaker enclosure is fastened to the removable panel, along with acoustical insulation, which also lines the cabinet top.



predrilled for screws—that fit together easily. In the kits we checked, the quality of materials and millwork was at least good, and in the majority of cases excellent.

- Construction data that is adequate, though far better presented by some manufacturers than by others.

- A saving of 35 to 40 percent over the cost of a factory-assembled enclosure of the same type. You would have a hard time building a box from scratch that would save enough money to justify the time you'd spend scouting for materials and doing the basic millwork.

What to watch for. The kits vary, naturally. Here are some specific points to consider when choosing yours:

1. Don't automatically settle for the cheapest, even among kits intended to produce the same type of enclosure. First find out just what is included in the package.

Some kits, the University job shown in the illustrations, for example, come without grille cloth, on the reasonable assumption that you may want to select your own for harmonious room decor. Obviously you would have to add the cost of this item to that of the kit, when comparing it to a similar model that does include the grille cloth. Some of the kits even come complete with wood-finishing stains and brushes.

2. Check the thickness and the grade of the plywood supplied. Most manufacturers furnish $\frac{3}{4}$ " fir plywood, either hardwood- or pine-veneered wherever a surface will be exposed to view. Thinner plywood may set up undesired resonance, and face surfaces that are not veneered will require special and sometimes troublesome finishing.

3. Steer clear of large console-type kits whose panels are assembled with nails instead of screws. Such construction is an invitation to trouble later on.

4. If you are definitely making the plunge into hi-fi and want to cater to the little woman's sense of styling, consider an enclosure kit that is one of a set of cabinets for other components that you plan to add later.

END

New Aids to Living



1 **Tub-shower doors** fold back to make a big opening for bathing youngsters or cleaning the tub. When the shower is used, a bar is swung across each plastic panel to form a pair of rigid sliding doors.



2 **Pocket guard** keeps pencils, glasses or cigarettes from falling when you bend or stoop. Wire stretched between two clips puts enough tension on the pocket to hold it flat against the shirt.



3 **Plug-in heat tray** does more than keep foods hot. The radiant-glass panel can be removed from its brackets and hung flat, to make a room heater with a thermostat, or a handy clothes dryer.

More information about the products shown on this page can be obtained from: 1. New Castle Products, Box 636, New Castle, Ind.; 2. Robert Lewis, Ligonville, N.Y.; 3. Sears, Roebuck & Co., Arthington & Homan Divs., Chicago; 4. Gift World, 35 Tarrytown Road, Blue Plains, N.Y.; 5. Kitchen Maid Corp., Andrews, Ind.; 6. Dapol Plastics, 90 Grace St., Worcester, Mass.

4 **Time rolls around** on this clock. Steel balls move in grooved tracks to mark minutes and hours, attracted by magnets traveling behind the dial. A ringed tripod tilts the clock face for easy visibility.



5 **Spice drawer** fastens beneath a wall cabinet and pulls out at an angle to make selection easy. It will hold a dozen spice boxes with room left over for other small, hard-to-store items.



6 **Step-on can** closes with a whisper instead of a clatter. The colored outer can and its leak-proof, one-piece liner are made of flexible plastic. The can and liner together weigh about 3½ pounds.



Gus Saves

The local critters wouldn't stay alive

By Martin Bunn

WHEN Gus Wilson heard the rumor that Pete Blinstock was getting so old that he was entering his second childhood he got a chuckle out of it. The rumor originated with Pete's rather excitable neighbors, Ezra Hendricks and Tom Hanratty. These three old codgers, who owned adjoining farms at the edge of town, were really the best of friends. But they took great delight in needling each other unmercifully.

"I tell you, Gus," Ezra Hendricks confided, his gray beard fairly crackling with indignation, "Pete's getting so old that he's beginning to slip his cable—acts like a Plymouth Rock pullet with her first egg."

"That's right, Gus," Tom Hanratty declared. "Only yesterday he scooped up my bull and plastered it against a rail fence."

"Scooped up your bull!" Gus breathed. "Now wait a minute, boys . . ."

"It's a fact," Hanratty insisted. "I was leading my bull across the road when here he came, around the corner and down the hill on two wheels in his old rattletrap, foxtail waving in the breeze, scooped up my bull on his front bumper and slewed it into the fence."

"Foxtail!" Gus ejaculated. "Do you mean to tell me that Pete Blinstock is running around with a foxtail on his car?"

"Right," Ezra declared. "And, if you ask me, with scrambled brains."

"CAN you picture Pete Blinstock," Stan Hicks, Gus's helper, said, mirthfully, after the two men had left the Model Garage, "dashing around with

a foxtail flying from his radio antenna?"

"Yes," Gus chuckled, "I can. Since Ezra and Tom are always making fun of Pete's car, it would be just like him to wave that foxtail in their faces just to get back at them. And it would be just like Tom Hanratty to lead his bull slowly across the road just as Pete Blinstock came along, to get a rise out of him."

Gus didn't see any of the three for a few days. Then, one afternoon, they drove into the Model Garage in Pete Blinstock's car, buzzing like a trio of angry hornets.

"This has gone far enough!" Ezra Hendricks yelled, shaking his finger under Pete Blinstock's nose.

"We've got the evidence on him this time, Gus," Tom Hanratty declared, holding up three very lively White Leghorn pullets with their legs tied together.

GUS could hardly hear himself think with the yelling and the cackling of the outraged chickens.

"If you weren't too dang tight to feed your chickens, Ezra Hendricks," Pete roared, "they wouldn't be pecking around in the county road where they could get scooped up—"

"Easy now," Gus stepped into the mix-up with a broad grin. "What's this really about?"

"My chickens," Ezra said indignantly, "were taking dust baths in the road, but



the Livestock

long unless Gus solved the mystery of Pete Blinstock's tracey dirndl.



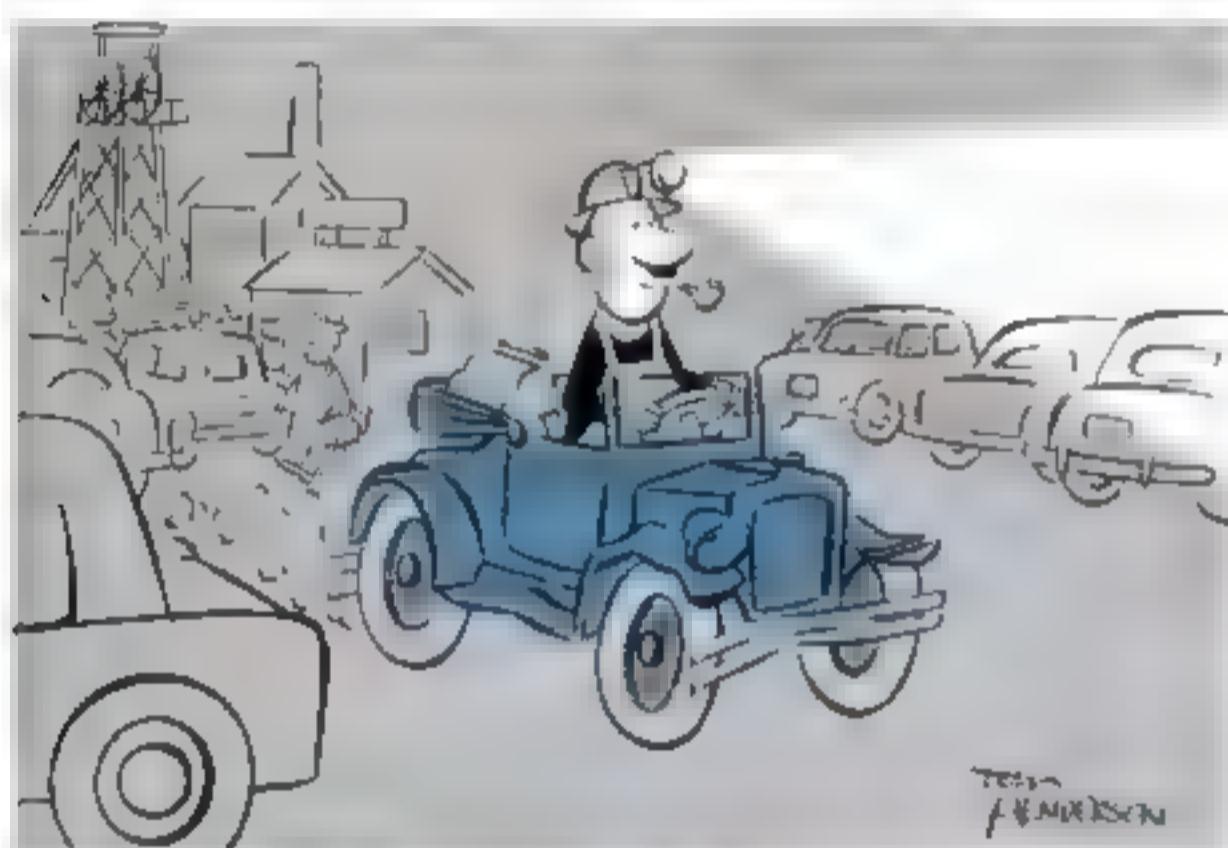
*Ezra's chickens were taking dust baths
in the road . . . Pete just leaned on the
horn and swished in amongst 'em.*

did Pete slow down? Not on your life. He just leaned on the horn and swished in amongst 'em."

"So," Hanratty said grimly, "me and Ezra got together for a showdown."

"Showdown my eye!" Blinstock retorted. "If they'd keep their stock out of the county road, Gus, everything would be all right. If there was another way around, besides down that hill in front of their places, I'd take it. But there isn't. Now and then my car slips out of gear on the downgrade, and before I can clamp on the brakes, away we go.

.....



"That's just one of his slippery alibis. There's nothing wrong with his car that hasn't been wrong since it came over on the *Mayflower*. And it's only been the past few days that he's taken to cutting up didoes with it, like a teen-ager."

"Maybe," Gus commented, rolling out his tool bench, "but I think we'd better take a look anyway."

Gus's first thought was to check and see if the studs which held the transmission to the bell housing were tight. When he found that they were, he checked the drive-shaft universal joint

for wear and looseness. Finding nothing seriously wrong here, he then checked the U bolts at the rear springs, thinking that looseness might have caused them to shear the centering pin on one spring or the other, causing it to move about and throw the drive shaft out of line.

GUS found his mind occupied with Pete's statement that the car only flew out of gear on the particular hill in front of the farms of his two neighbors.

"Let's go for a drive," Gus said.

"We'll go along, Gus," Ezra announced firmly. "We want to be on hand when you get the goods on him."

With the trio in the car with him, Gus drove around town, putting the car down the Pine Street hill. Everything seemed to perform perfectly, except the brakes, which certainly did need attention. In fact, Gus was vaguely disturbed because things functioned too perfectly. It seemed to Gus that the last time he had driven Pete's car the clutch had been grabby, and that he had recommended that it be worked over. It occurred to Gus that the hill before Ezra's and Tom's places broke over a rocky ridge.

And here's their stock all over the road..."

"Hold it," Gus held up his hand. "Let's forget the livestock for a minute. Did you say that your car slipped out of gear on the hill, Pete?"

"That's right," said Pete, "and that's what I'm here about. I wouldn't put it past these two characters to have had a hand in this gear-jumping business. Mighty peculiar, ain't it, Gus, that the hill in front of their places is the only hill where my car slips out of gear?"

"I wouldn't know about that," Gus said grimly, "but if your car is slipping out of gear, Pete, you'd better have it fixed, and quickly."

"Pay him no mind, Gus," Ezra said.



Why Cars Need Winter Thermostats

Opening at a higher temperature, they improve cold-weather performance. Now is the time to think about changing over.

By E. F. Lindsley

SWITCHING to a hotter thermostat for winter driving is like putting up storm windows. You can get by without it, but you may lose in both fuel economy and personal comfort.

Many drivers in the northern states make the switch each fall. Maybe you should—maybe you shouldn't. Now, before winter comes, you ought to check your cooling system and present thermostat. If you decide to change 'stats, this would be a convenient time to do it.

What's a hot 'stat? It's one that lets

water circulate to start cooling your engine at a temperature somewhere from 170° to 190°. The cold, or normal, one now in your car (unless you've already changed) opens in the 150° to 165° range. In bitter weather, it will keep your engine cold and cranky for a long time, while you're developing chilblains because the car heater doesn't deliver.

A hot thermostat delivers quicker warm-up, gets your engine smooth and responsive much sooner, and gives you heat that much faster. The price of switching 'stats is a couple of bucks and a couple of hours, and the time to do it is

before putting antifreeze in the system.

There's one catch: the type of antifreeze you use may determine whether you can go to a higher opening 'stat. With methanol (alcohol), the stuff may boil away.

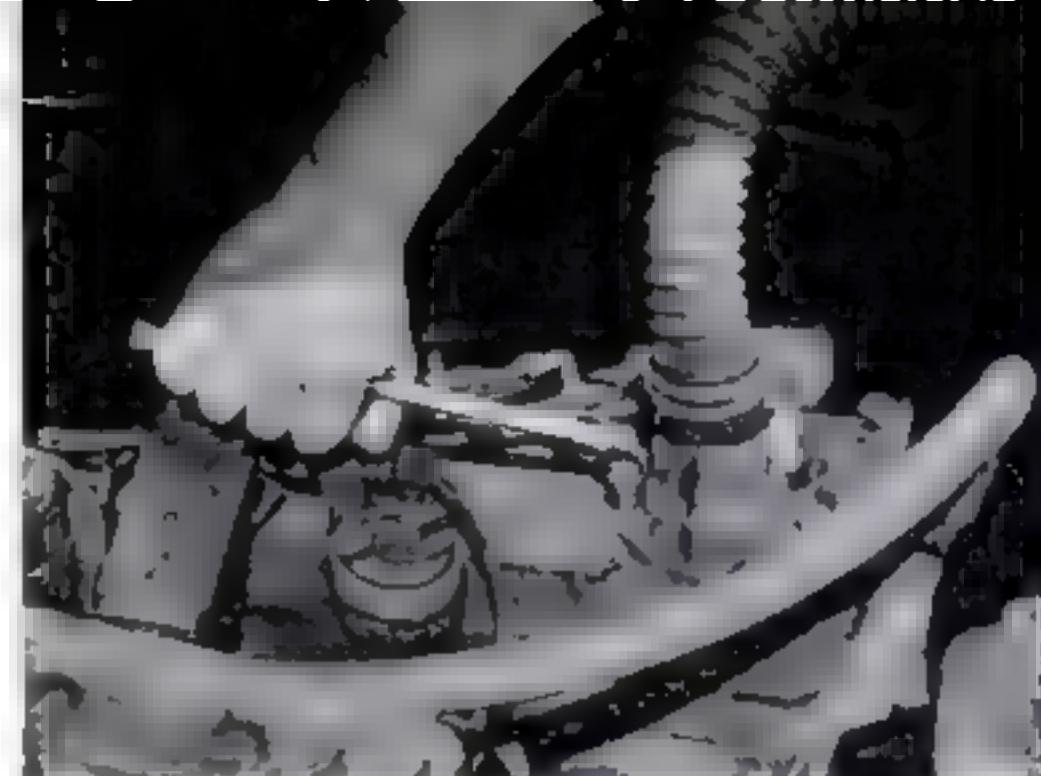
But if you use permanent antifreeze, and especially if you drive a late-model car that performs best at a high operating temperature, a hot 'stat will give you minimum engine wear, top economy and performance, shorter warm-up periods and quicker heater response.

Once you do switch, you can probably leave the hot 'stat in both summer and winter—unless you do extremely hard driving in very hot climates. Should engine cooling seem marginal in hot weather, look for such contributing factors as a slipping fan belt, swollen hoses that impede circulation, a rusty or gum-clogged radiator, or even bugs in the honeycomb, before you pull out the hot 'stat and go back to a cold one.

Why check your 'stat? A thermostat is a temperature-responsive valve that blocks coolant flow during engine warm-up. If it's working well, it takes the place of the shutter fronts of the Twenties and Thirties, or the chunk of linoleum that you may have tied to the front of the radiator in zero weather to shut out the cold air.

But in anywhere from 18 to 24 months, a 'stat can grow sluggish, never quite opening, never quite closing. If it locks in full-closed position, which isn't likely, your engine will protest by boiling like a Stanley steamer. If, on the other hand, the 'stat valve is sluggish, or happens to stick open, you'll get no dramatic warning. But engine performance will be poor, particularly in winter. Your car won't warm up and the heater and defroster won't deliver.

As a bonus, apart from assuring good engine and heater performance, a 'stat check may pay off in a more important way—reduced wear and tear on engine parts. This is particularly true if you drive a late-model car. A high-compression engine, with such features as hydraulic valve lifters and an automatic



SIMPLE THERMOSTAT HOUSING without a bypass connection is removed from the cylinder head by loosening two nuts. But don't forget to drain the cooling system before you start



CHECK THE 'STAT'S OPERATING RANGE with hot water and a high-temperature thermometer. Here, a .003" feeler gauge under a capsule 'stat's door comes free at opening temperature.

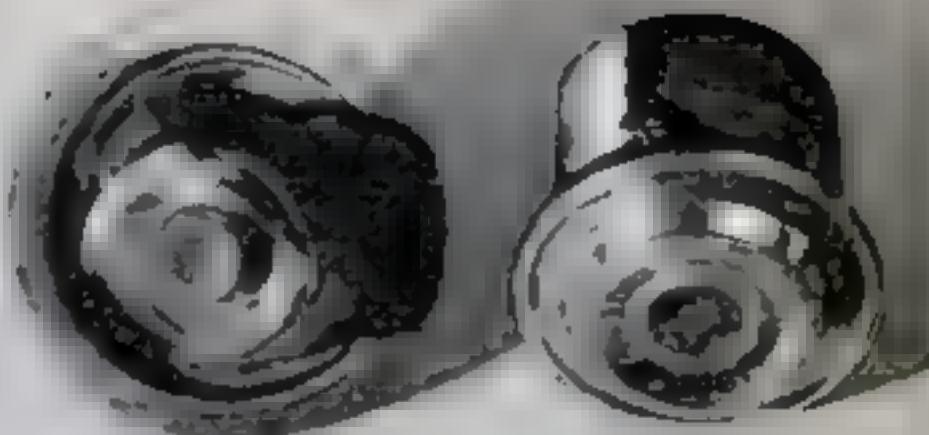
choke, makes an accurately functioning thermostat a must.

The thermostat teams up with the pressure cap on the radiator to pressurize and restrict water flow in the system, thus forcing the coolant into the tight, cored passages around the valves and spark plugs. When the 'stat sticks open, the water takes the easiest flow paths, leaving areas of low pressure to form hot steam pockets.

In cold weather, this condition becomes worse. High localized temperatures strain against frigid iron in other parts of the water jacket. With the wash of raw gas sometimes present from an



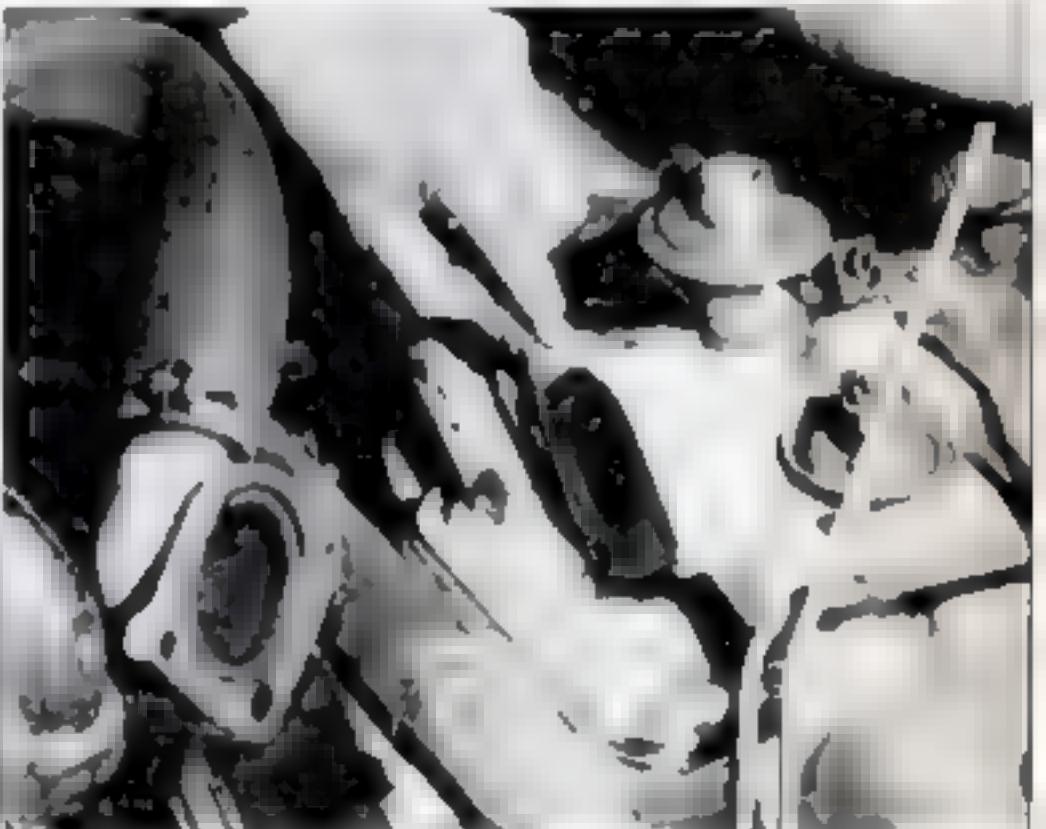
OUTLET-ELBOW THERMOSTAT HOUSING with a bypass connection is removed by parting it from both the engine and the water pump. Check the position of the 'stat before you pull it.



THERMOSTAT IN YOUR CAR may be of the capsule type (left) or bellows (right). When making a replacement, don't switch from one type to the other, or you may be in for trouble.



CLEAN AND FLUSH THE VENT if plugged. Otherwise trapped vapor and air may push water out of the radiator overflow. Note the opening temperature stamped on this thermostat.



CLEAN THE COUPLING FACES while the thermostat is out, and use factory-made gaskets for a tight seal. Notch at the top of the elbow outlet keeps the 'stat from being inverted.

automatic choke, the pistons, rings and cylinders take a beating.

A good 'stat eases the situation by shunting water through a back door to the water pump, and confining the warm-up circulation to the jacket and head. Thus all the iron warms up at one time, and raw gas is vaporized by the heat.

An open 'stat may also cause messy black residue to coat everything it can light on in a cold-running engine. Anyone who has removed the rocker-arm covers in such an engine knows how much sludge coats the rockers and springs. What this mess does to close-fitting valve lifters is not hard to guess.

Besides the sludge, varnish and some corrosive products may form from combustion gases that leak past the rings. When crankcase and jacket temperatures are held high enough, the stuff vaporizes and goes through the breathers.

Many modern engines have the "back door," or bypass to the water pump mentioned before. While the still-cool 'stat is blocking off the radiator, the bypass permits some circulation for quick warm-up and even temperature distribution. When the 'stat opens, the main flow resumes its normal pattern.

On short runs to the station, the store and to school, the bypass helps a



WRONG WAY to replace a thermostat. The capsule or bellows should always face the "hot" side (toward the engine). If your car overheats in a hurry, this may be the reason.

lot. In addition to preventing cylinder heads from getting hot while the block is still cold, and causing mechanical stresses, the additional heat aids in vaporizing raw fuel.

Checking or changing the thermostat is usually a two-bolt and one-gasket job, unless there is a bypass connection to

the water pump, in which case a second gasketed coupling must be parted. Some V-8's have a separate 'stat for each bank of cylinders. Be sure you change both.

These four simple rules will keep you out of trouble, whether you put the old 'stat back in or replace it with a brand-new one.

1. Always mount the 'stat with the heat-sensitive bellows or capsule on the hot side (toward the engine).

2. Discard old gaskets. Use new ones, preferably factory made; a leak means trouble. Cutting your own gaskets is not worth the few cents it saves.

3. If you install a new 'stat, buy one that is made for your car. Some modern cooling systems don't work well with bellows-type 'stats, even though they may fit. Others rebel at the capsule type and don't let water by freely.

4. If your car uses the capsule type, install it to give the least possible water-flow restriction when open. Some are keyed with a notch in the housing and a dimple on the flange. If yours isn't, use your best judgment to place the door edgewise to the flow when open. **END**

Could You Qualify as a Carpenter's Helper?

A boss carpenter would expect you, as his helper, to know answers to questions like those below. Do you? Check your answers, or guesses, against the answers printed upside down at the bottom of the page.

- 1 What would you get if the carpenter, while working on a window, asked for the apron?
- 2 Where would you look for a collar beam—in the attic or in the cellar?
- 3 Would you expect to find the jamb in the cupboard of a house just completed?
- 4 If your boss spoke of a double-header, would he necessarily be thinking of baseball?

5 Where would he use risers while he was building a new house?

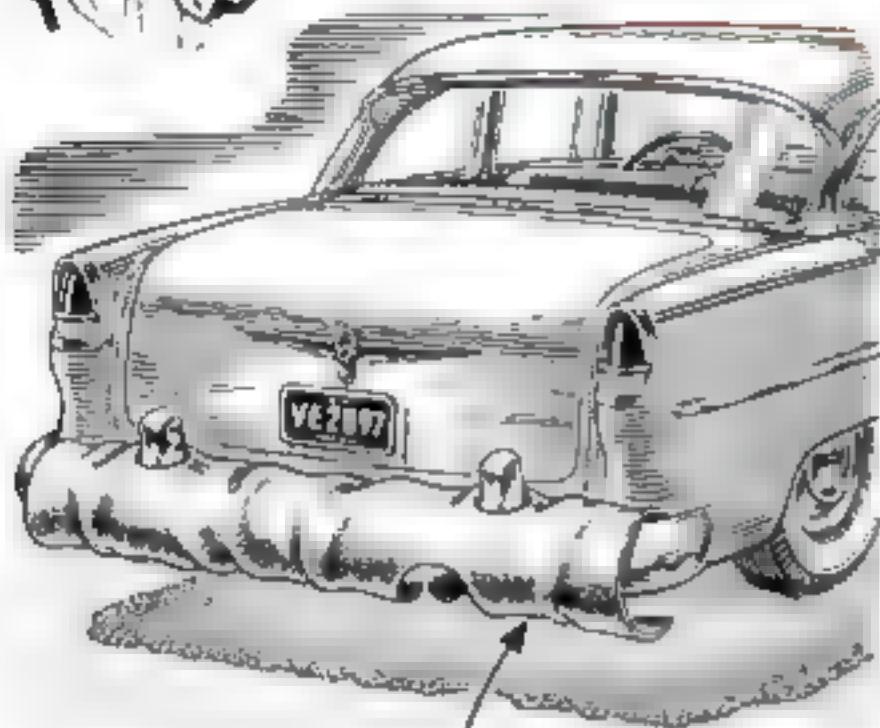
6 What would the carpenter want if he asked you for a couple of wiggle nails?

7 Is it likely that he would install base shoe at the foot of the stairs?

8 Would you expect to find a stool in every window in the house?

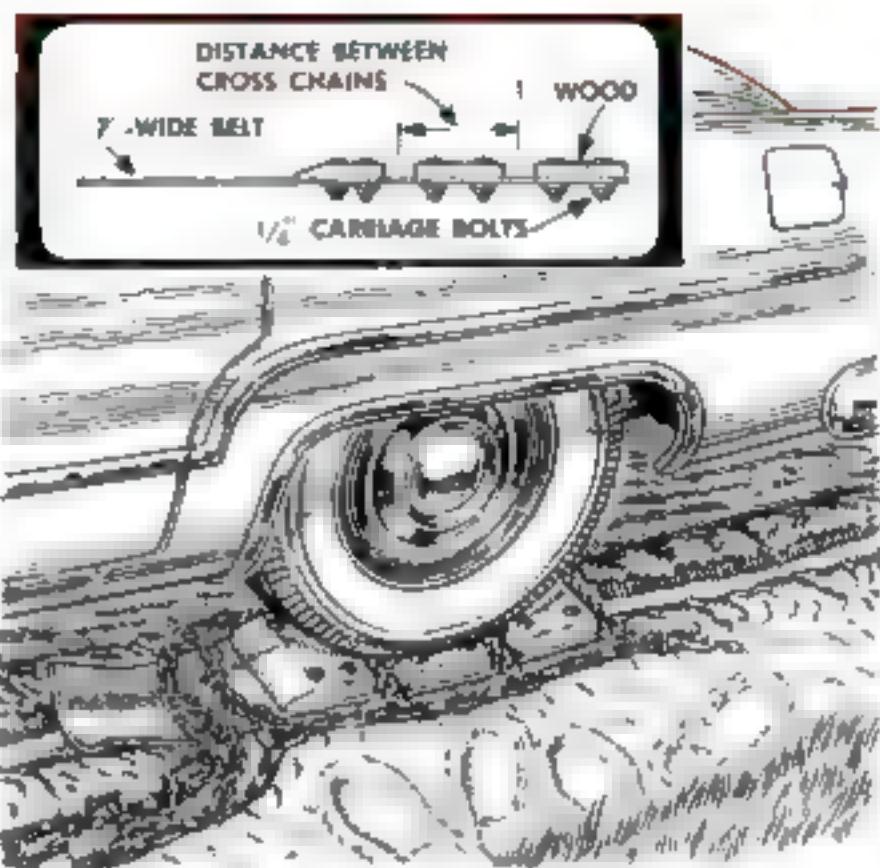
1. The straightest and neatest part of the house, 2. A frame to the outside of the window, 3. In the attic, 4. A nail with a wavy head, 5. Risers are the vertical parts of a staircase, 6. A straight, 7. Base shoe is the molding at the foot of a wall, 8. A plain piece placed on the outside of the house, 9. The lowest part of a window inside the house, often erroneously called the sill. Take off to the right.

Hints from the Model Garage



PIECE OF TRUCK INNER TUBE HELD IN PLACE BY HOLES WHICH GO OVER TOPS OF BUMPER GUARDS

Chrome saver—that's what one man calls this strip of truck inner tubing. The bumper guards, projecting through holes, hold it over the bumper to protect the chrome when he has to be pushed.



Wood blocks help put chains on to get out of mud. Move the car forward as far as you can, put the blocks, with the chains on top, behind the wheel, back onto the blocks, and then fasten chains.

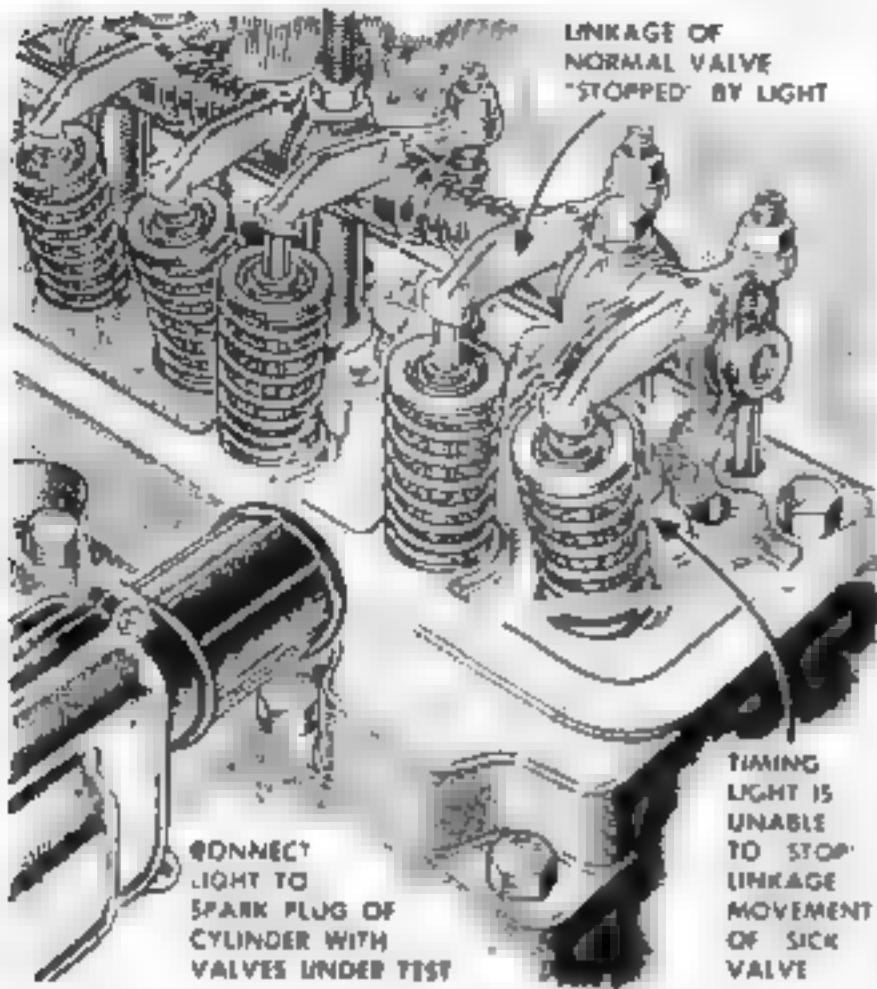


Running water in your car—for drinking or washing small fingers sticky with candy—is simple to install if you adapt a windshield-washer kit available from accessory stores for about \$5.

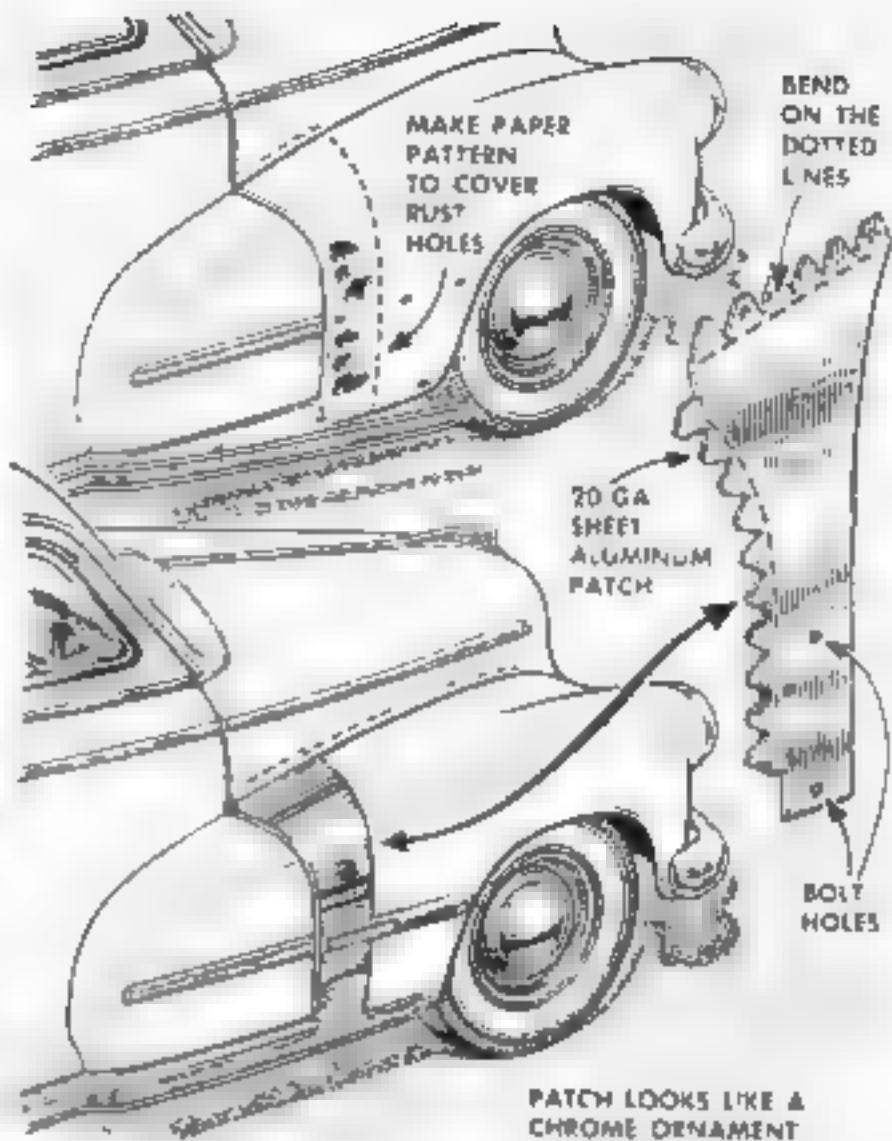
The kit includes a jar with a bracket

that is screwed to firewall or trunk, a foot-operated pump that goes near the headlight-dimmer switch, rubber tubing, and two jets. For your water supply, simply mount the jets in holes in the dash instead of outside the windshield.

More Hints from the Model Garage



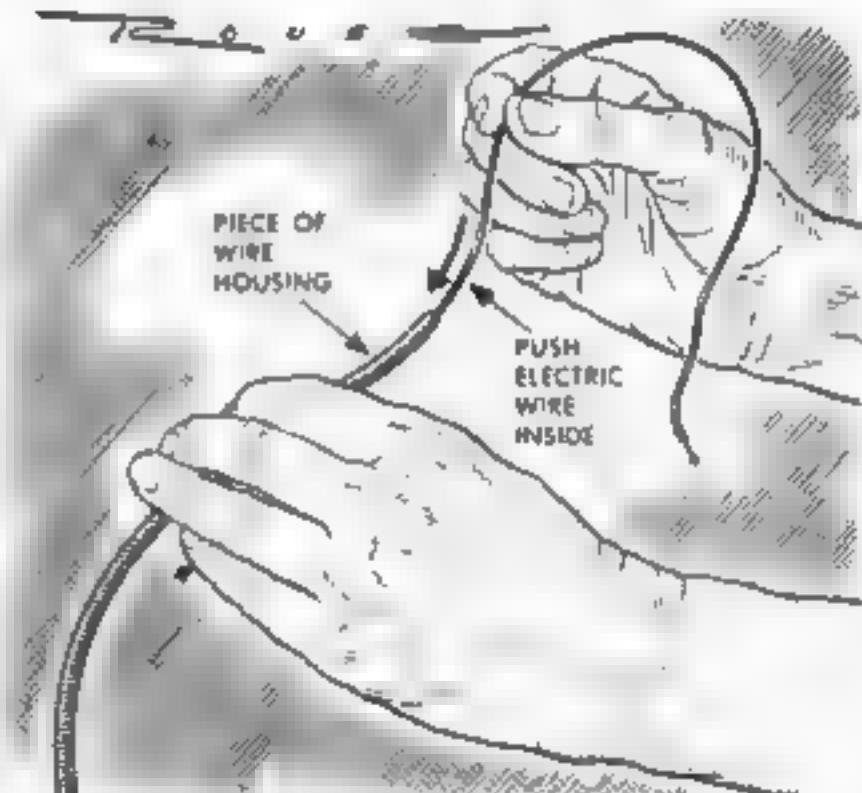
Try a timing light when you suspect sticking valves. When the cylinder fires, the valves should be closed—and both valve stem and spring will appear stationary under the timing-light flash. If there is sticking, you will see a hesitant movement of valve stem or spring.



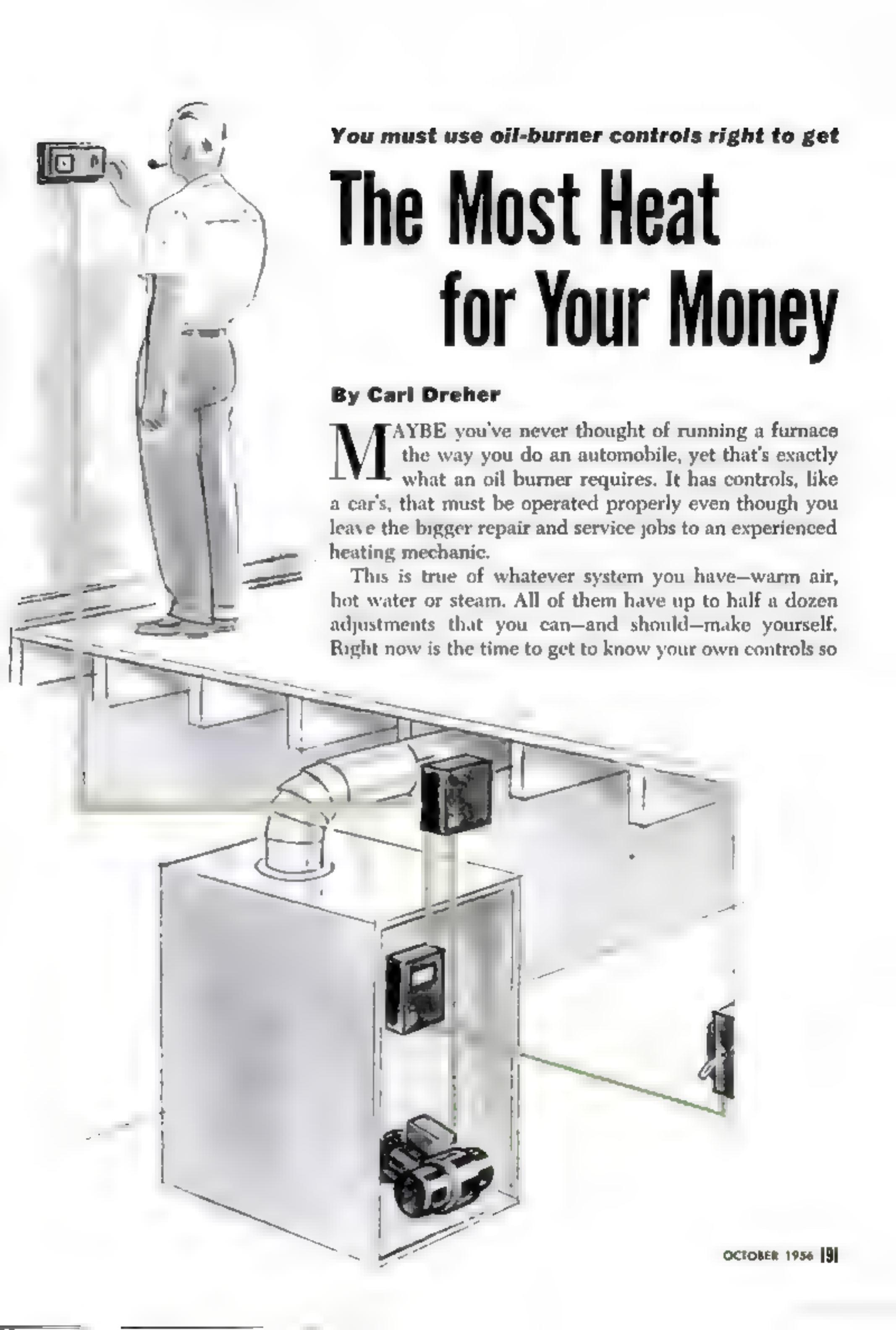
A quick fix for a rusted fender is an overlay of sheet aluminum—it looks like extra chrome. Remove trim pieces and make a paper pattern of the area. Snip the aluminum, then stretch and hold it in position with bolts concealed by the hood and trim. Scallops lock it tighter.



Distributor troubles sometimes come from hard-baked deposits that a cloth won't clean out. They yield readily to a fine wire brush, 2" or 2½" in diameter, that you can mount in a file handle.



To protect auto wiring that is subject to heavy abrasion, make up your own miniature BX cable by threading the wires through the flexible armor used to sheathe speedometer cables or choke wires.



You must use oil-burner controls right to get

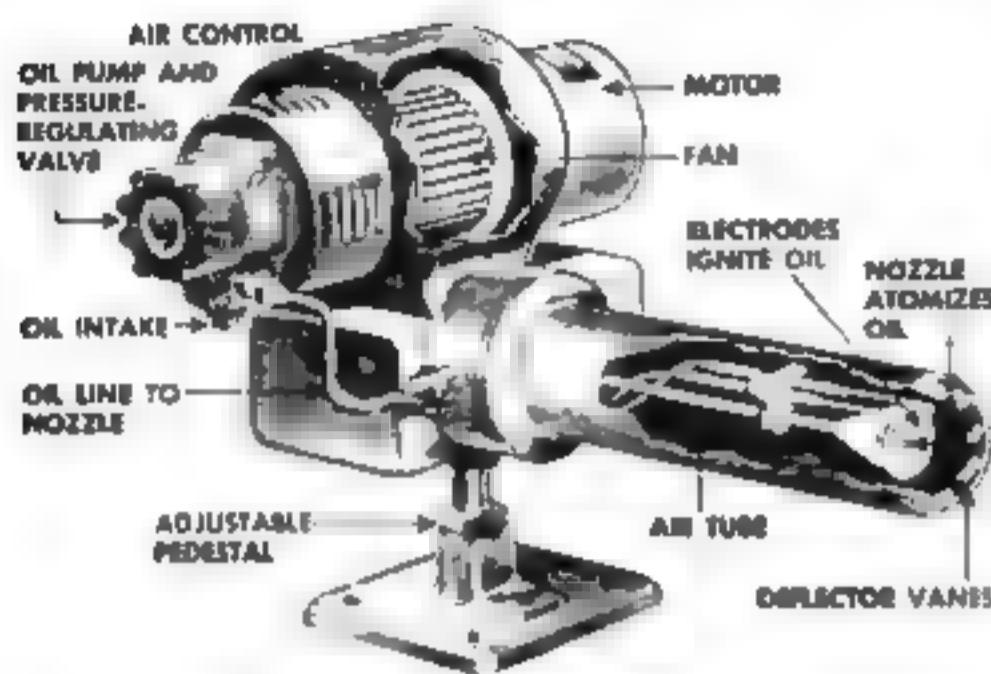
The Most Heat for Your Money

By Carl Dreher

MAYBE you've never thought of running a furnace the way you do an automobile, yet that's exactly what an oil burner requires. It has controls, like a car's, that must be operated properly even though you leave the bigger repair and service jobs to an experienced heating mechanic.

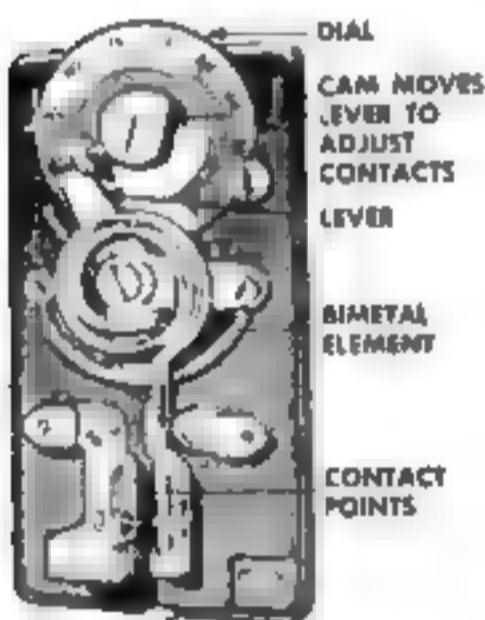
This is true of whatever system you have—warm air, hot water or steam. All of them have up to half a dozen adjustments that you can—and should—make yourself. Right now is the time to get to know your own controls so

Oil Burner



A smoky flame wastes fuel. Air control, usually a sliding collar that varies size of intake, can be adjusted so that it burns clean and bright. Other adjustments are for a serviceman.

Thermostat



When you set dial to desired heat, the cam rotates, adjusting gap between contacts. As the bimetal element cools and contracts, contacts close, turning on heat; as element expands, contacts open and heat turns off.

you can get the most heat with the least money and effort.

Oil burners in a nutshell. An oil burner is an electrically driven pump with a nozzle that atomizes the oil and mixes it with air. This mixture is then ignited by an electric spark and burned to produce heat. The heat is transferred to a circulating medium—air, water or steam—which distributes it throughout your house.

Every oil burner has three basic controls—the thermostat that tells the furnace when heat is needed, the primary or stack control that actuates the burner itself, and the limit control that keeps temperatures within a preset range.

Set it, but don't forget it. That seems-so-simple thermostat can actually kick up a mess of trouble if it gets out of kilter. If Junior playfully turns

down the dial to 50 degrees, that's just what you'll get. You'd be surprised at the number of service calls that result from such simple causes.

Clock-type thermostats that provide an automatic setback at night must be carefully adjusted to keep the day and night cycles in proper sequence. One family froze for several days and sweltered during the nights until they discovered that the two cycles were reversed. This frequently happens when the clock is stopped by a power failure or is switched from daylight saving time back to standard.

In resetting a clock thermostat, always move it *ahead* to the correct time. A cycle indicator on the face should show white between 8 a.m. and 8 p.m. and black or a color between 8 p.m. and 8 a.m. If the indicator is reversed, move the clock hands ahead 12 hours.

With either an automatic or manual thermostat, setting the temperature down 10 degrees for eight hours at night should give you a fuel saving of five to 10 percent. The one exception is a radiant concrete slab, which operates more efficiently at a constant temperature setting because it heats up slowly.

Try different settings. In addition to the temperature control, some thermostats have a control that varies the length of the periods that the furnace is on and off. This may be a dial marked S at one end for Short and L at the other for Long. At S, the furnace will run for short periods frequently, and at L for long periods but infrequently.

Frequent periods provide more even heat and greater comfort than long periods that overshoot between too-hot

and too-cold. However, if the periods are too short, combustion efficiency will be low, and the discomfort will come when you receive the oil bill.

To find the best setting for you, start at the S end of the scale and see how far you can move the dial toward the L end without sacrificing comfort. Try each setting for a day or two at least.

If you aren't getting any heat at all, your thermostat can be the culprit here, too. If everything else in the system checks good—power on, oil in the tank, no blown fuses—the switch contacts on the thermostat may need cleaning. Remove the cover and run the temperature control up and down so that you can see the contacts open and close. Slip a strip of paper between the closed contacts and rub up and down a few times. Never use sandpaper.

The magic button. Perhaps you've frozen for several hours waiting for a service man to arrive, then all he did was press a button, on went the furnace, and you wondered why you couldn't have done that yourself. You can, provided you do it very, very carefully.

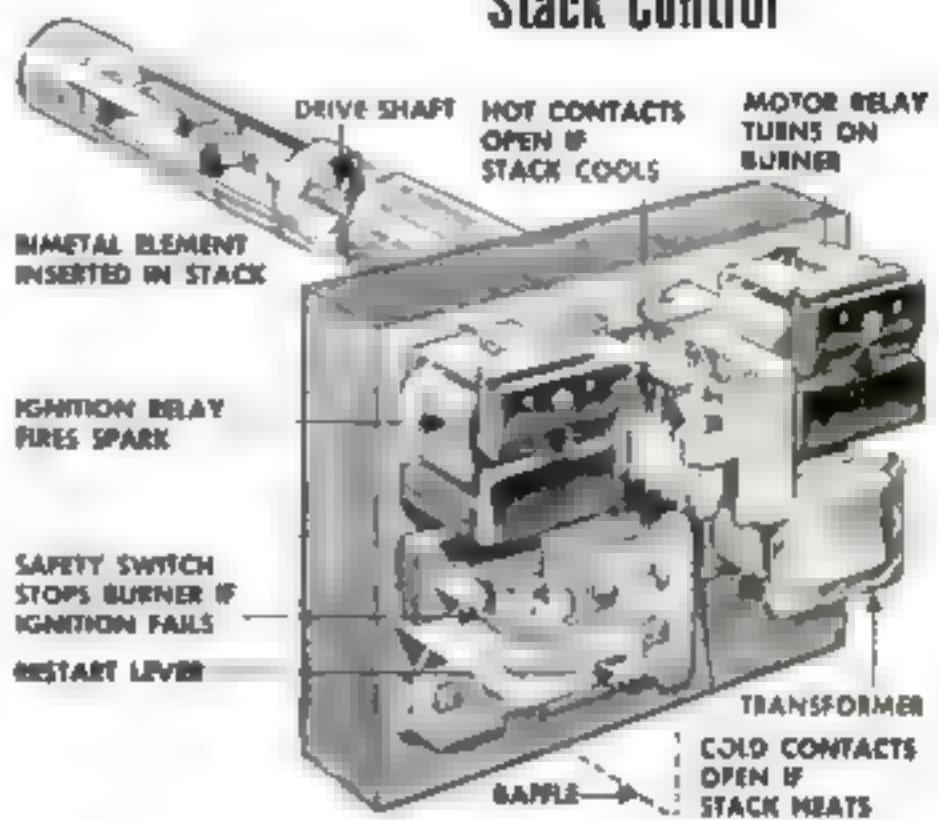
The button is part of the primary control (also known as the stack control, master control, combustion control or safety control). This is usually mounted on the smoke pipe outside the furnace or on the face of the furnace near the top.

When the thermostat tells the oil burner to go on, the primary control starts the oil squirting into the furnace and fires the ignition. If the oil doesn't ignite within 90 seconds, another kind of thermostat, called a stack switch, shuts the burner down to prevent accumulated fumes from exploding.

When the service man pushed the button, all he did was reset the stack switch and let the burner try again. You can do the same yourself, and if the ignition failure is only temporary, the furnace will start up. To be safe, always wait at least five minutes after a furnace has failed to start before you press the restart button. It takes this long for the oil vapor to clear away so that it won't explode when the ignition is turned on again.

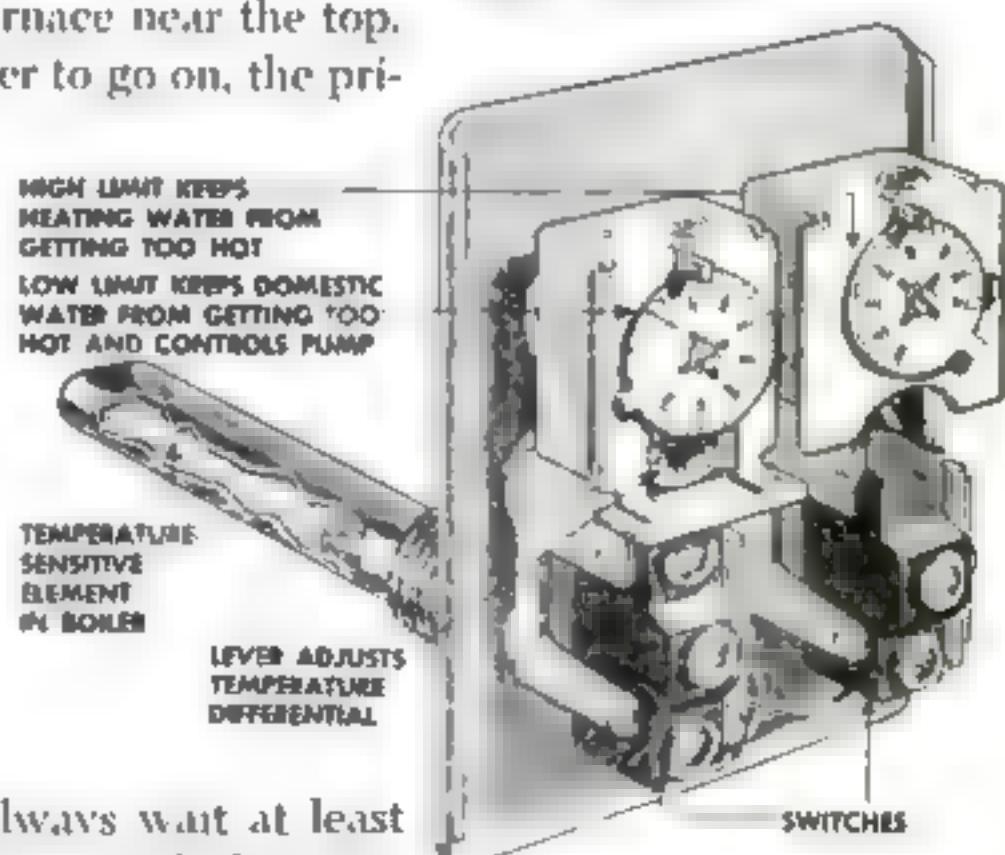
If the furnace fails to start after the first push, don't try it

Stack Control



"Magic button" is restart lever shown above that you press to recycle furnace. If bimetal element doesn't get hot, contacts on drive shaft fail to close and burner shuts down.

Limit Control



Aquastat (Minneapolis-Honeywell) sets upper safe limit and on some systems has second dial to control domestic hot water.

again. Shut off the main power switch, check to make sure you're not just out of oil, then turn the trouble over to a repairman.

The stack switch will also stop the furnace if a flameout occurs while it's running, but here an automatic restart device waits for the vapor to clear, then turns on the ignition by itself. Pressing the manual button in this case won't do any harm, but probably won't do any good either if the furnace has already failed to start on the second try. Never remove the cover from the primary control or from any other controls around the furnace as the parts are delicate and there is danger of shock.

The limit control. Often, on very cold days or during the steep morning pick-up, a furnace may overwork and become too hot while the thermostat is still calling for heat. It's the job of the limit control to override the thermostat and impose temporary cooling-off periods when the furnace heats up beyond a safe, preset temperature.

On hot-water and steam systems, you will find the limit control beside or above the furnace, usually on the outlet

pipe. On warm-air systems, it's mounted on the plenum—the hoodlike housing on top of the furnace where the air ducts branch off.

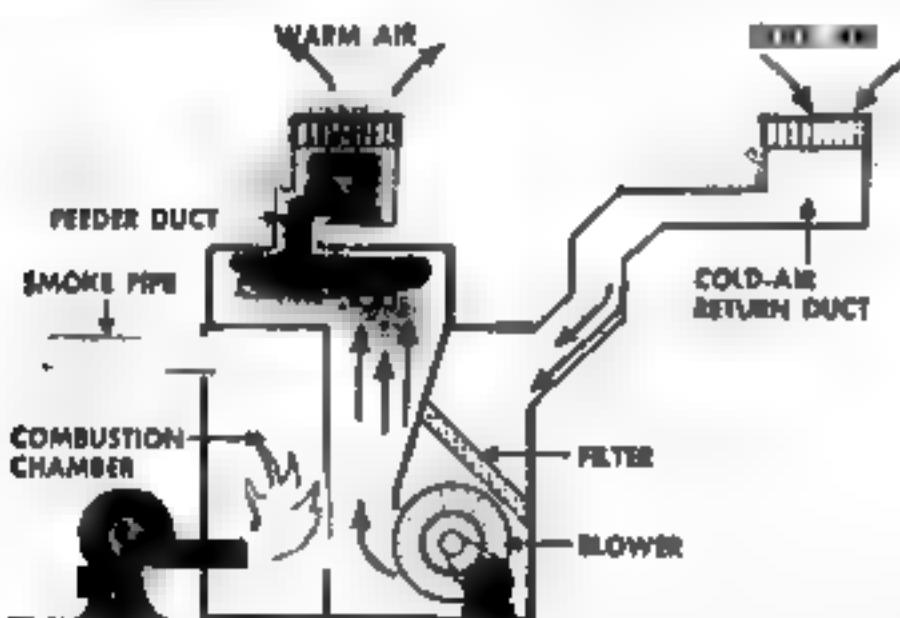
Safe limits are set at the time of installation, usually between 180 and 200 degrees for hot water and air and between four and eight pounds for steam. The settings should not get out of adjustment except when accidentally touched or when someone has attempted to use the limit switch as an operating control. Setting the control down may give the effect of reducing heat on mild days, but it will prevent the furnace from supplying enough heat on cold days. Setting the control up is downright hazardous.

You can correct the control yourself if you know exactly what the setting should be. This varies with individual installations and frequently is established by local codes. **Special controls.** Besides the three basic oil-burner controls, you will find additional ones depending on the type of system you have.

On a forced-air system, you have a control to tell the blower when to start and stop. This is usually combined with the limit control, but the adjusting knobs or pointers are separate and clearly marked.

The fan control waits until the air warms up before it

How a Warm-Air Furnace Works



Oil-burner flame heats air as it passes up and around walls of combustion chamber. Blower pulls cold air from rooms into furnace and pushes it back into rooms through warm-air ducts.

turns on, so that cold air won't be blown through the house. Then it shuts the blower off as soon as the air cools below a preset temperature. The best cut-in temperature for the blower is usually between 130 and 150 degrees; 135 is a common setting. Cut-out temperatures vary from 100 to 115 degrees.

Often these temperatures are set for average conditions and may not suit your particular requirements. Try to adjust them just high enough to eliminate the discomfort of cool air. If the cut-in temperature is too high, you'll get sudden, infrequent blasts of hot air, instead of even heating. If the cut-out temperature is too high, you may be wasting air that's still hot enough to use.

On a gravity warm-air system, you won't have a fan to operate, but you can exert some control by adjusting the dampers or louvers in the registers. If a room is too warm, move the register control toward off. This will also help to send heat to other, colder rooms.

Hot-water systems. "Wet" heat differs from "dry" or warm-air heat in that while air is everywhere, water must be added as it's needed and given room to expand as it heats.

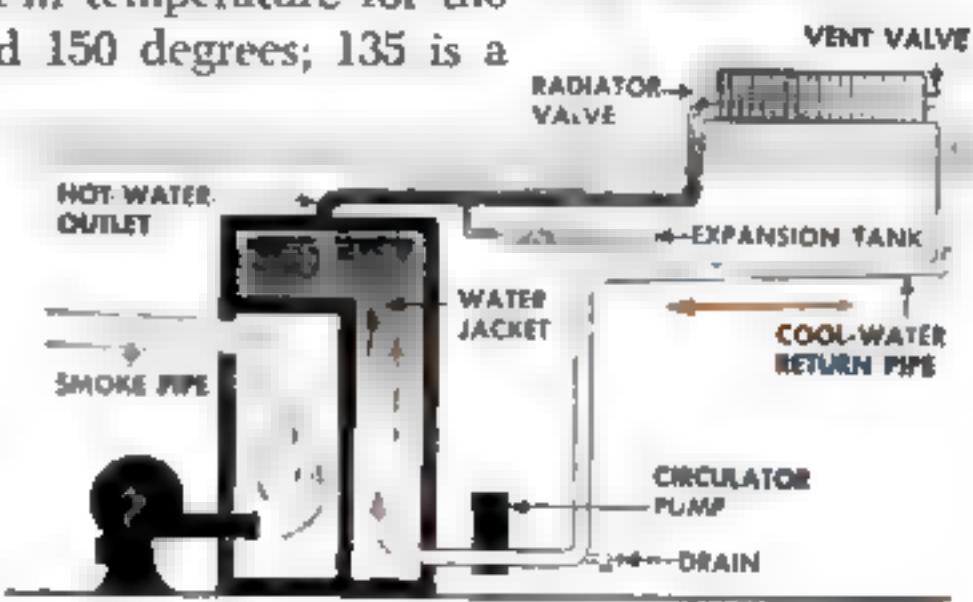
In some installations, an expansion tank is placed at the highest part of the system with an overflow pipe to the outside. This is called an "open" system, and if too much pressure builds up, excess water automatically runs out the overflow pipe.

In newer "closed" systems, a sealed expansion tank is placed at either the highest or lowest point in the system to provide a cushion of air for water to expand against. However, if pressure gets really high, a separate pressure-relief safety valve will open up. This is a small, round fixture coupled into a pipe near the furnace that has what looks like a miniature pump handle on top.

The valve may pop off, but will do no harm. Unless it continues, don't worry about it.

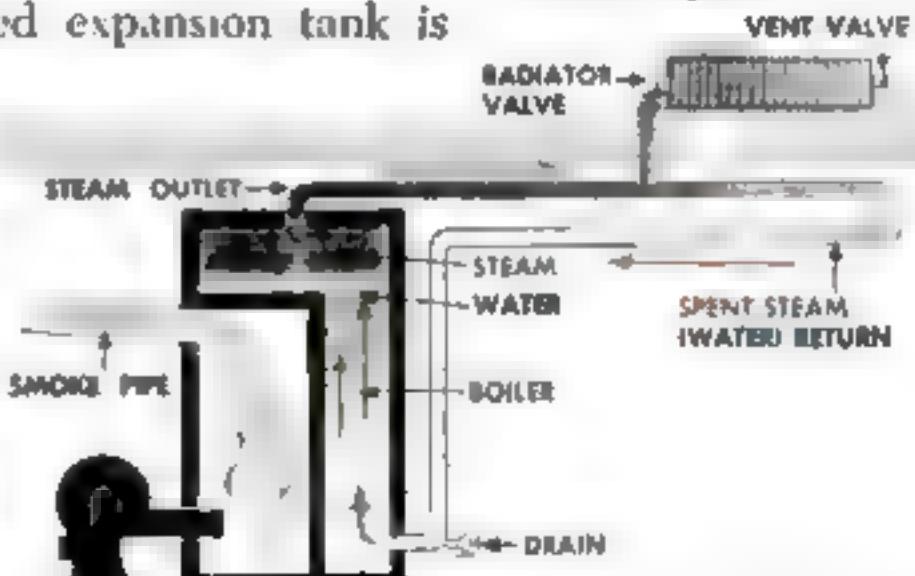
Often a blowoff merely indicates that the air cushion in the tank has been absorbed, leaving nothing flexible for the water to push against. You can refill the tank with air by closing the inlet valve at the side of the tank and draining

Hot-Water Plant



Water in coils around combustion chamber is heated and pumped to radiator through inlet pipe at one end. Pump pulls cold water back into furnace through a second, outlet pipe in the radiator, so that same water circulates continuously.

Steam System



Steam works like hot water, except that water is heated much hotter. Steam, under its own pressure, enters radiator, condenses, and flows out through same pipe back into boiler.

out the water through a cock on the bottom. When the tank is empty, close the bottom cock, reopen the inlet valve, and this will let water back in against a new air cushion.

Adding water. If the pressure gets too low, there's not enough water in your system, and the furnace will not deliver heat properly. In closed systems, water is added automatically when needed by a pressure-sensitive valve, usually mounted next to the pressure-relief valve.

In open systems, you must add water manually yourself. On the furnace you will find a dial called an altitude gauge next to the thermometer. It has two pointers, a fixed red one that indicates the proper level of water in the system, and a black one that shows the actual water level. If the black pointer drops below the red one, run water into the system slowly through the inlet valve at the side of the boiler until the two pointers coincide.

You'll also find an altitude gauge on a closed system, and if its two pointers don't line up, it may indicate that the automatic inlet valve isn't properly adjusted. This valve usually looks similar to the pressure-relief valve except that it doesn't have the miniature pump handle on top. Instead, it has a screw adjustment on top, reached by removing a cap, that raises or lowers water pressure.

If you're sure you can spot the right valve, turn the screw slowly to the right to increase pressure until the black pointer coincides with the red one. If the black pointer overshoots the red, back off the screw to reduce pressure.

Venting radiators. Air trapped in radiators lowers heating efficiency and should be bled off each fall. This is done by opening the air vent on top of each radiator with a key until the air stops hissing out and is followed by water. Vent keys are available at hardware stores if you should lose one.

Hot-water baseboard convectors should be vented the same way. The valves are usually located where the riser pipes come up through the floor and may be reached by removing a section of the

metal baseboard cover. Radiant slabs are vented by a single valve mounted on top of the boiler. Recheck the altitude gauge after bleeding off air and add more water, if necessary, to fill up the system.

Steam heat. A steam plant may look very similar to a hot-water system, but you can tell the two apart because steam radiators have only one pipe entering them; hot-water radiators have two.

Since you boil water to get up steam, the boiler is equipped with a pressure gauge. You don't need to pay much attention to this since only a small head of steam is required to heat a house. It may show two to three pounds on very cold days, but if pressure goes beyond this the limit control will take care of it. If the limit control should fail, there's a relief valve on the boiler.

You do have to keep an eye on the water level, though, because there's always some loss, and with a small supply to begin with, it doesn't have to get very low before you start losing heat. A glass sight gauge on the side of the boiler shows the water level. It should be between half and two-thirds full.

If the water level drops too far, an automatic cutoff shuts down the burner. In this case, you must wait several hours for the boiler to cool to avoid possible cracking, then run water in through the inlet valve until it reaches the proper level on the sight gauge. You can, however, add small amounts of water if you do it slowly and while there is still a good supply in the boiler. Thus a periodic check of the gauge may save you the delay of a complete shutdown.

If your radiators have old, nonadjustable vent valves, it will pay you to add new adjustable ones. These will enable you to balance the system for individual room requirements.

One point some owners overlook is that the radiator intake valve must be either completely open or completely closed. The reason for this is that live steam enters—and spent steam in the form of water leaves—through the same pipe. A partly closed valve interferes with this two-way passage.

END

Keeping the Home Shipshape



LEAF TOTING IS EASIER if you can latch onto a plastic table cloth or shower curtain that has seen its best days indoors. Handles make it easier to lift the filled sling or pull it over the ground. Make them of heavy cord or tape threaded through grommets that have been inserted in the four corners of the plastic sheet.



WETTING DOWN WALLPAPER for stripping goes faster if you use a paint roller dipped in hot water. And it's neater, too, because there is less uncontrolled dripping of the water.



AN OLD BEACH CHAIR can be cut down and reassembled as shown to make a comfortable back rest for reading in bed. The canvas sling seat is left full length so that your legs help to weight it down. It can be folded and stowed behind a door when it is not in use.



A TIMESAVER for small paint-spraying jobs is a stockpile of empty ink bottles. Partially fill a bottle with paint and set it inside the spray cup. Turpentine in another ink bottle will clean the gun later.



A half hour...

that's all it takes to lick

The Two Winter Foes of a Power Mower

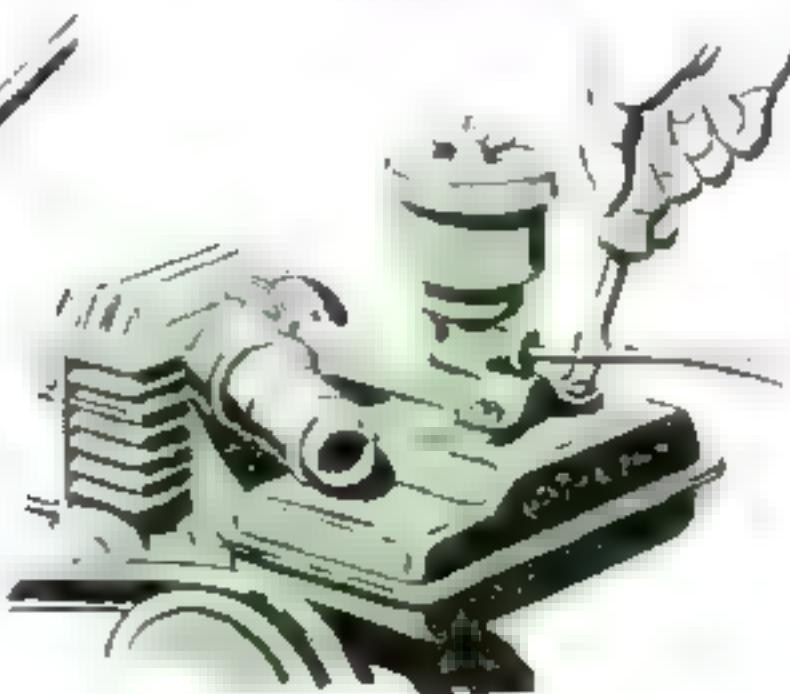
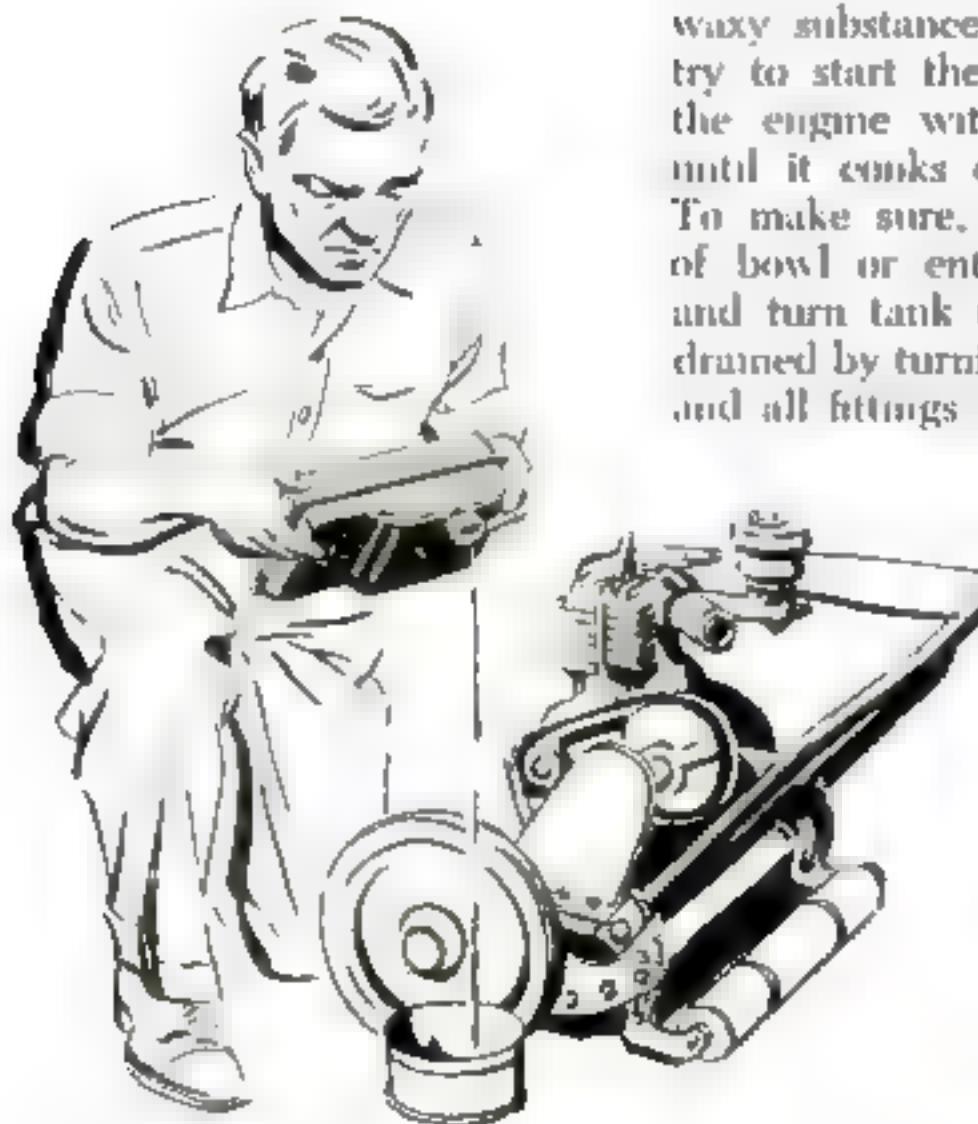
THE life expectancy of a gasoline power mower, even with the best of care, is apt to be unexpectedly short. One point included in "the best of

care" is proper storage for the winter, a chore that owners tend to neglect despite the investment involved in the machine. Yet it's an easy job, one that can normally be gotten out of the way in a half hour or even less.

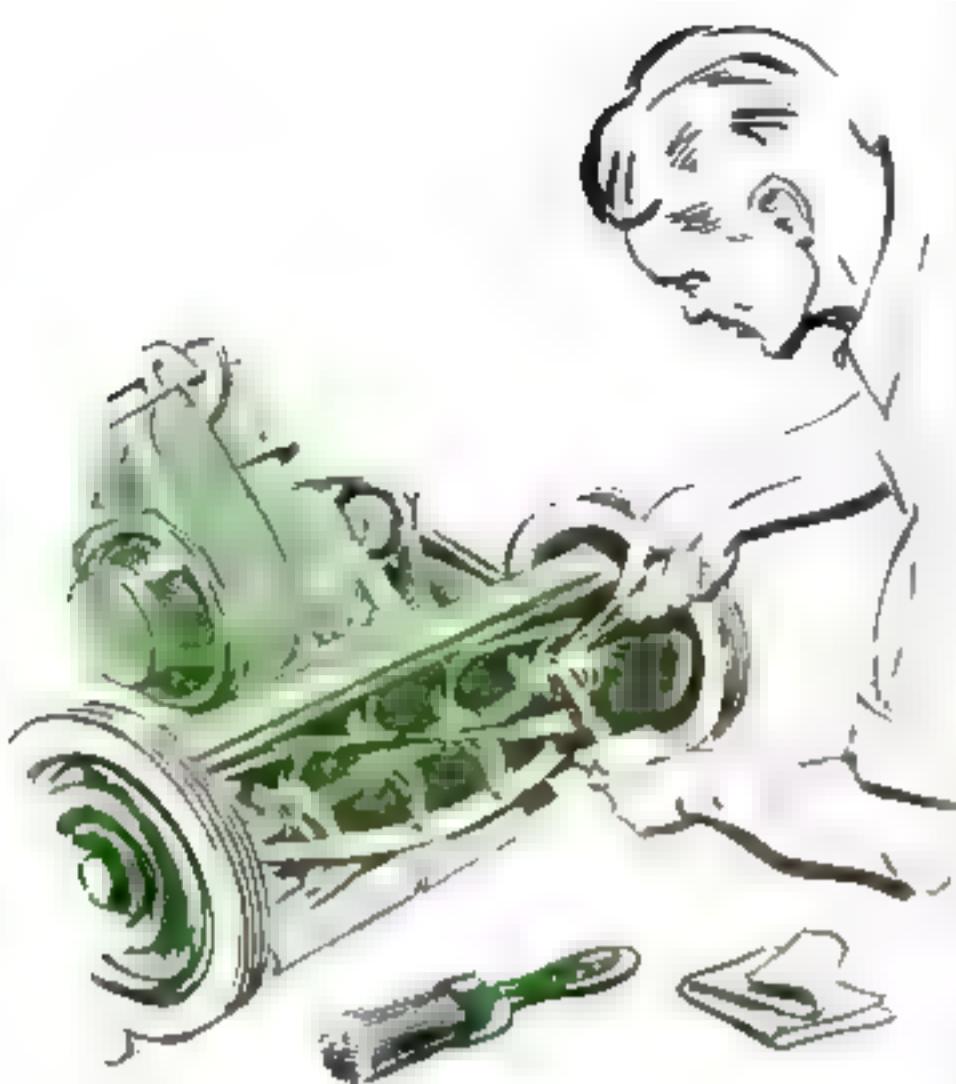
Here's what to do, how to do it, and about how long each step will take you

How to avoid FUEL GUM

It's important to remove gasoline from the carburetor, fuel line and tank. Fuel left in—even for as short a time as two weeks—evaporates, leaving behind a gummy or waxy substance. This clogs the passages. Next time you try to start the engine you'll have trouble. So, start up the engine with an almost-empty tank and let it run until it coughs out. This should run the carburetor dry. To make sure, you may want to remove screw at base of bowl or entire bowl. Disconnect fuel line and tank and turn tank upside down. In some cases, tank can be drained by turning the entire mower over. Replace the tank and all fittings. *Estimated time: 10 minutes.*



How to fight RUST



2 A thorough cleaning is a sound first step toward preventing rust during the storage period. Cut away grass wrapped around the reel shaft, brush dirt from all the crevices, and scrape away debris accumulated on the cutting edges. *Estimated time: 8 minutes.*



3 Remove the spark plug after blowing dirt from around it. Then pour in a spoonful of engine oil and turn the engine over slowly several times to spread the oil over cylinder walls and piston. Replace plug and draw tight. *Estimated time: 2 minutes.*

4 Oil and grease all lubrication points, following instruction manual if you have one. Wipe all metal parts with an oil-soaked cloth and apply a coating of grease to the cutting edges. *Estimated time: 8 minutes.*

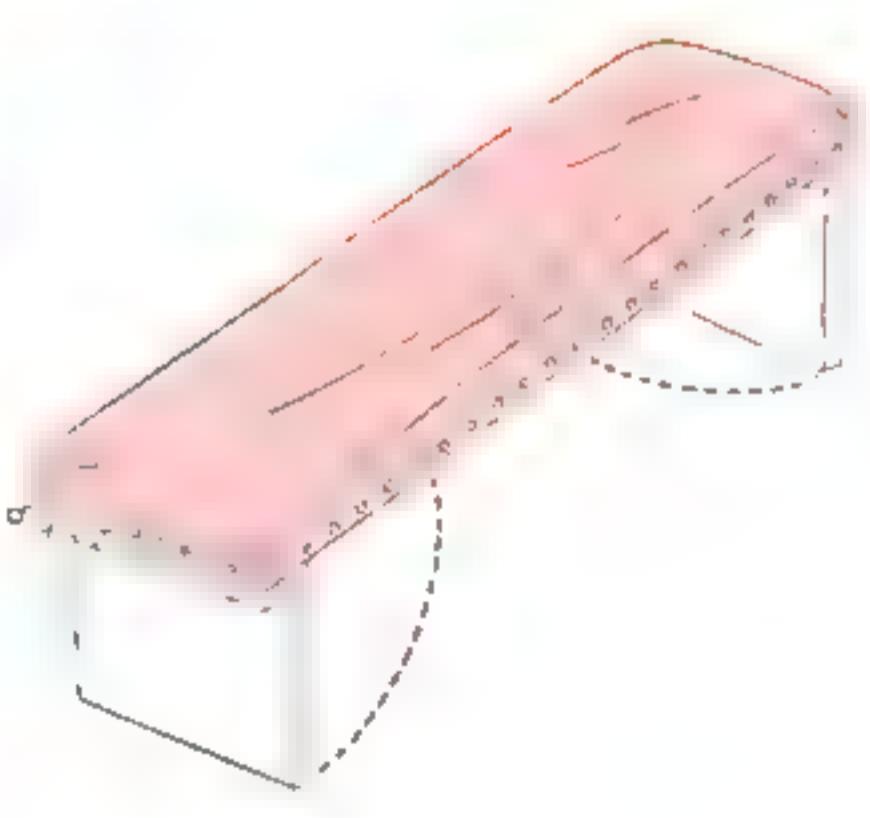
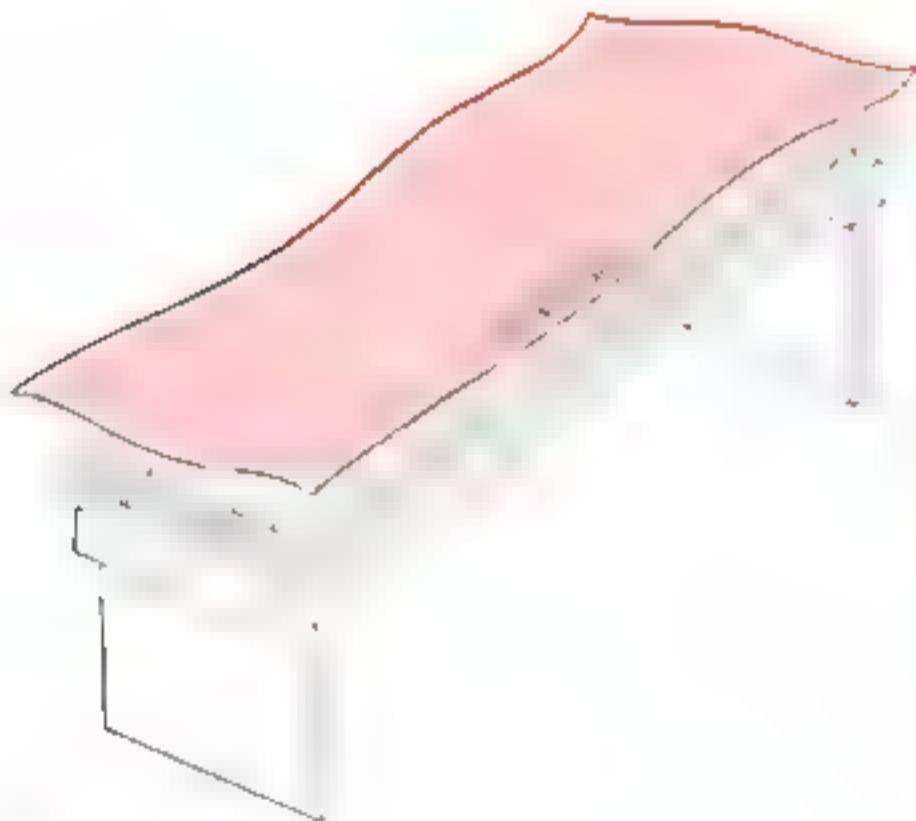
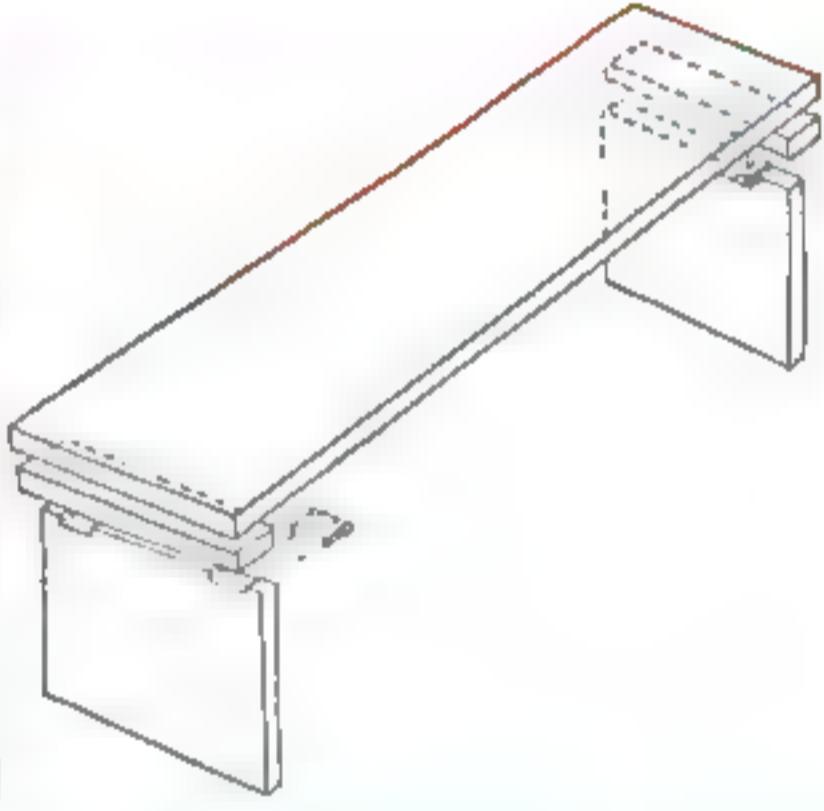
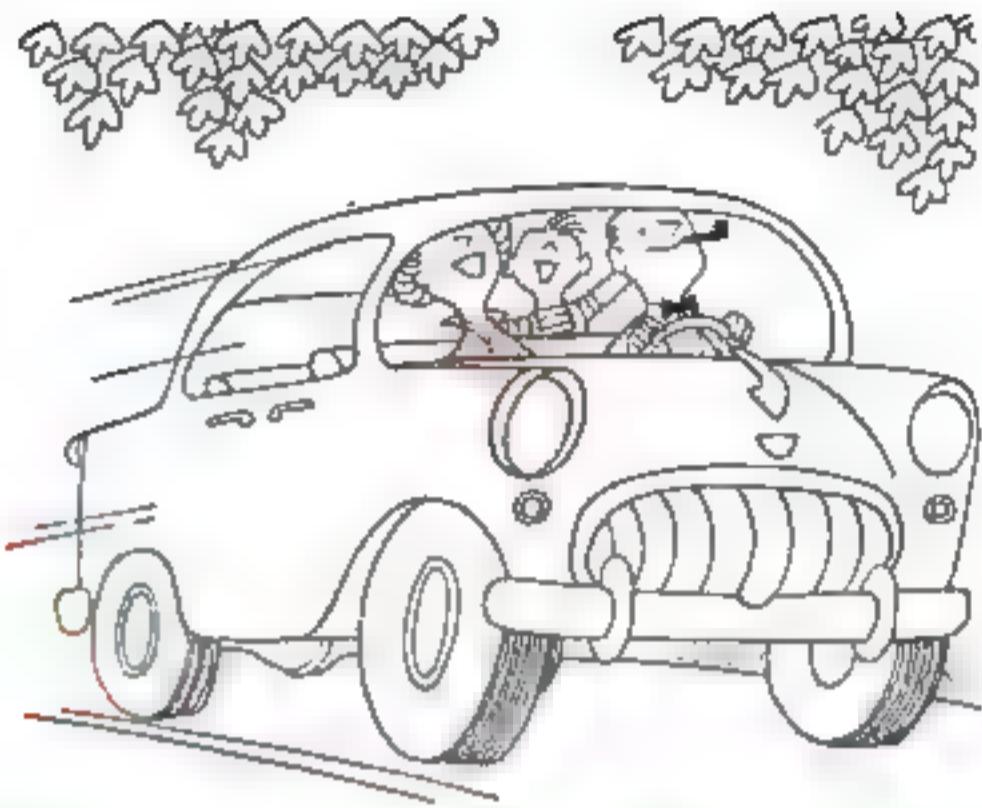


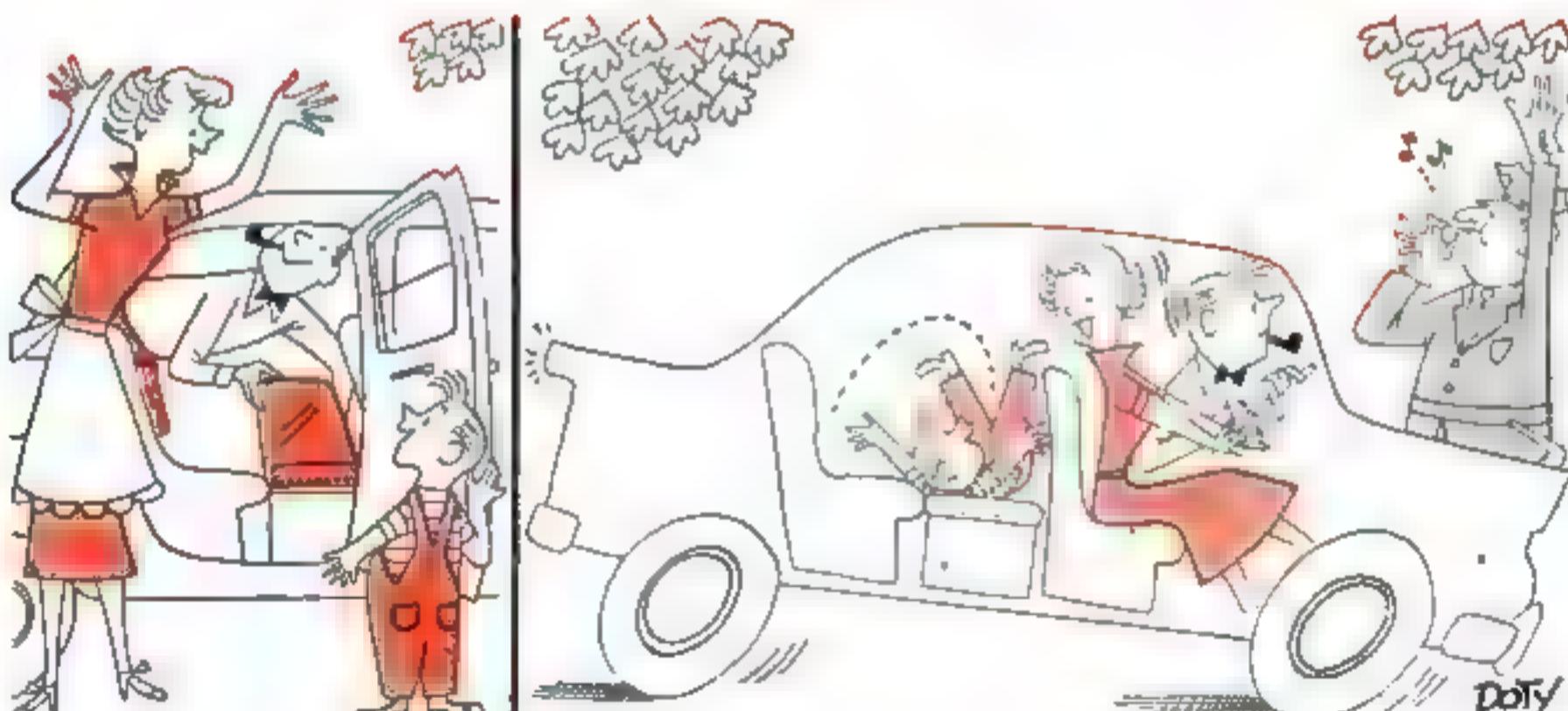
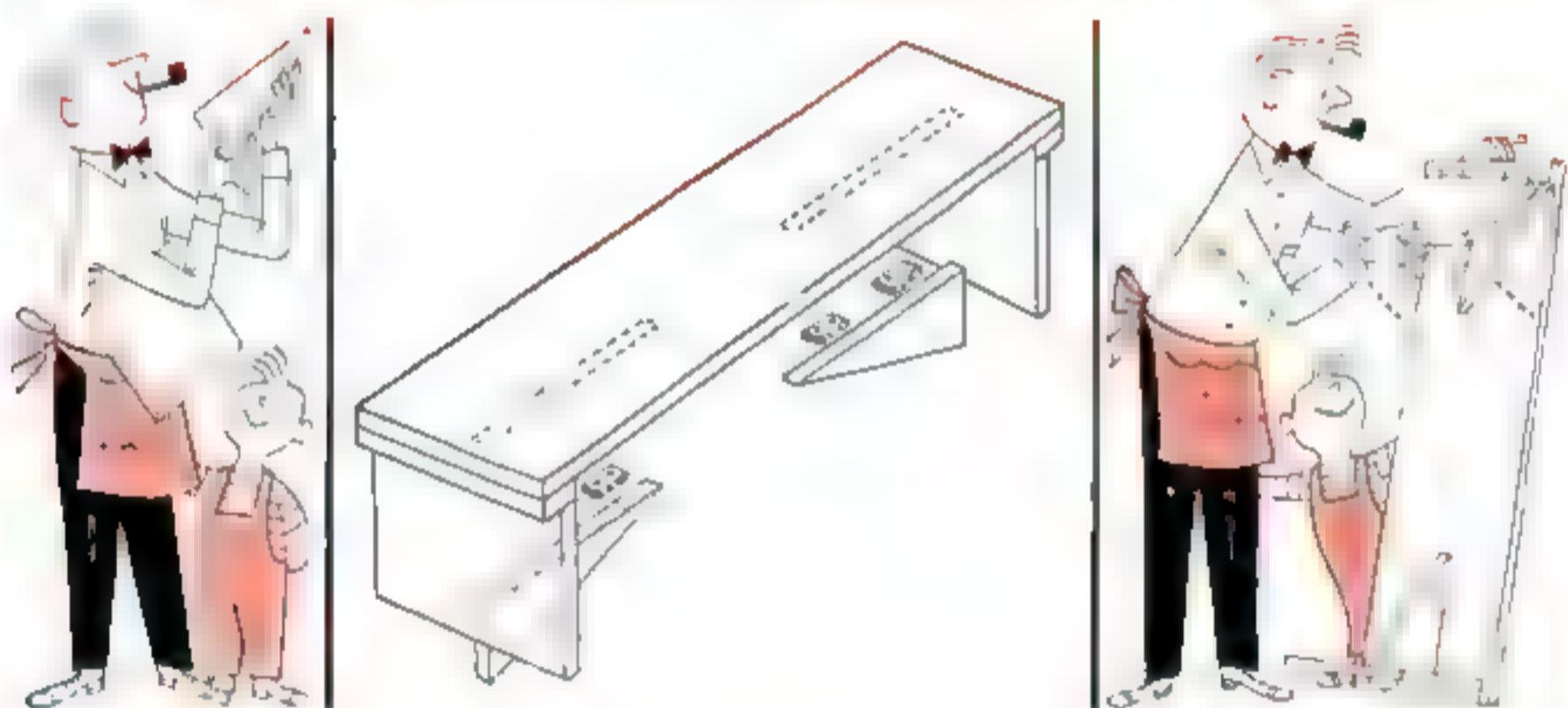
5 Store the mower in a dry place. Avoid leaving it in direct contact with a dirt, concrete or gravel floor. Wood is best. Rest the wheels on a couple of two-by-fours if the floor is not wood. *Estimated time: 2 minutes.*



By Roy Doty

Wordless Workshop



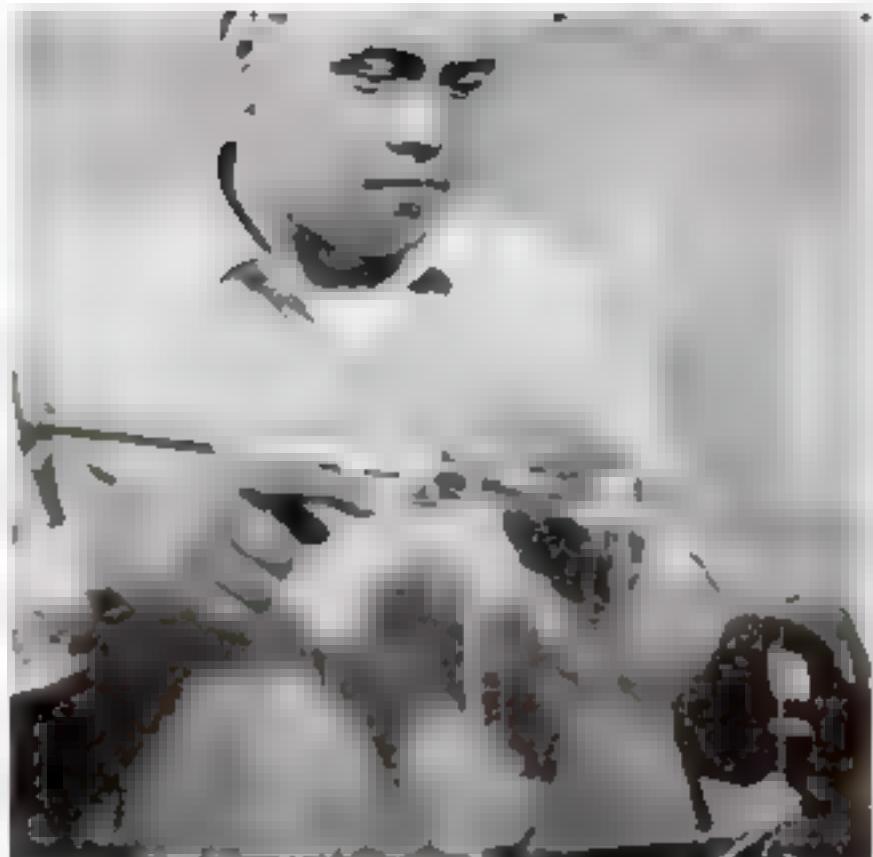


Next Month: A kitchen cutting board with a rack to keep it handy

New Tools



1. Glue Injector Drills Holes. This combination tool will inject glue into old dowel joints, under loose veneer and in other hard-to-reach spots. It has a bit on one end to drill a pilot hole (above left) and a nozzle on the other end to squirt in a stream of glue. The drill is stored in the plunger end when not in use.



2. Hacksaw Cuts to Any Depth. There's no frame to get in the way on this British-made hacksaw, which is now available in this country. A standard hacksaw blade is locked in a pistol-grip holder that slides back and forth on a tubular support, leaving the end of the blade free for straight or curved cuts to any depth.



3. Angle Finder Marks Stock. You can rotate this dial-type level to any angle on a shaft, then mark the spot with a punch that runs through the tool. The V-shaped, magnetic base automatically centers the marking punch on the sides of round stock or can be used against flat stock. The balance float rides in a sealed mercury reservoir and works in any position.

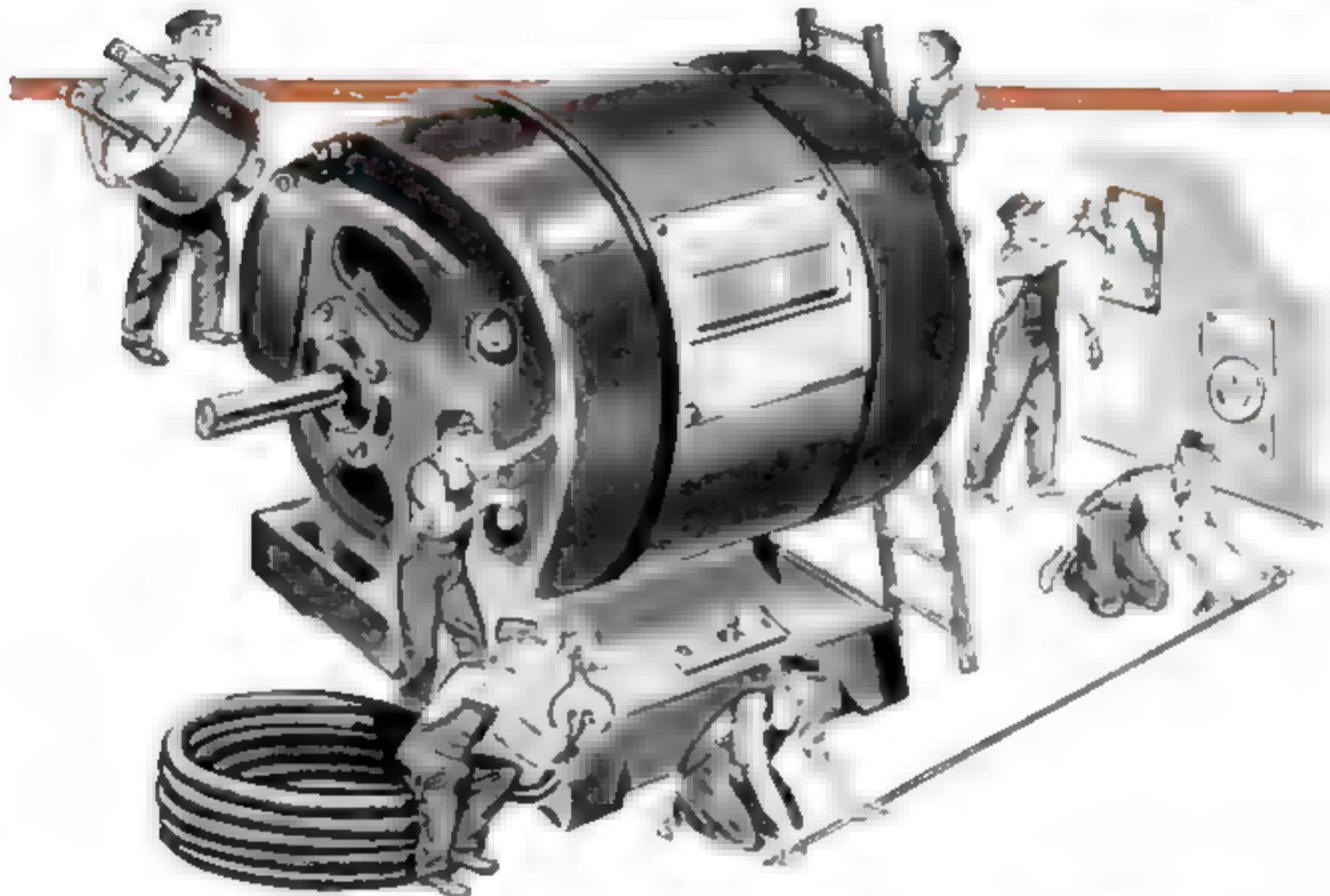


4. Vibrations Tell Motor Speed. This pocket gauge clocks the speed of a gas or electric motor by counting its vibrations. You hold it against the motor housing and let out a wire until it vibrates in resonance with the motor. These vibrations are then translated into r.p.m., shown on the upper scale. The lower scale shows actual vibration cycles per second.

More information about the products described on this page can be obtained from: 1. Bram cliff Co., Hillen Rd. and Centre Ave., Towner, Md.; 2. Holibee Products Co., 114 Mid St., Parma, Mich.; 3. Racine Instrument Co., 500 College Ave., Racine, Wis.; 4. Precision Instrument Service, 301 Franklin Ave., Franklin Square, N.Y.

**Cam Evans, who knows his amps,
explains the important facts about**

Shielding Motors from Burnouts



By Jack Foster

A SMELL of hot insulation stopped me in the doorway of Cam Evans' shop. Bud Nolan, the teen-ager who haunts the place, said hello. Cam looked up from his test bench.

"What's up, Jack—seen a ghost?"

"I've got a short at my house, but here it smells like one."

Cam chuckled. "I'm running overload tests on a solenoid control. How's that garage extension of yours coming?"

"Okay, Cam, except my table saw blows these as fast as I put them in." I displayed a burned-out fuse.

Cam peered at it. "Whatever you have," he said, "it isn't a short."

I must have looked skeptical, for he went on. "That fuse window is darkened only where the link melted. An over-

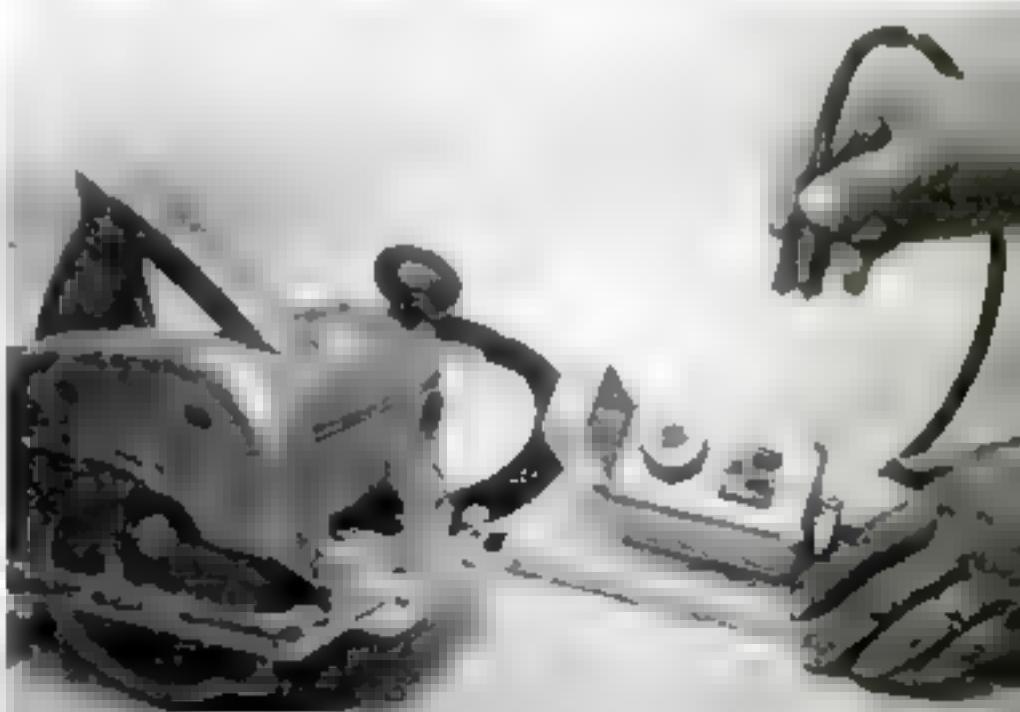
load blew it. A short vaporizes the link, blackening most of the window."

"Never knew that. Here's my last good fuse, but it won't fit the socket."

Cam glanced at the second fuse I fished out. "That fits a special socket."

"Uh-huh, in my oil-burner line. Seems silly to have two kinds of sockets," I

USE THREE-WIRE CORD and a fused receptacle of the grounding type with portable power tools. The third wire (which must be grounded at house outlet) protects the user from shock.





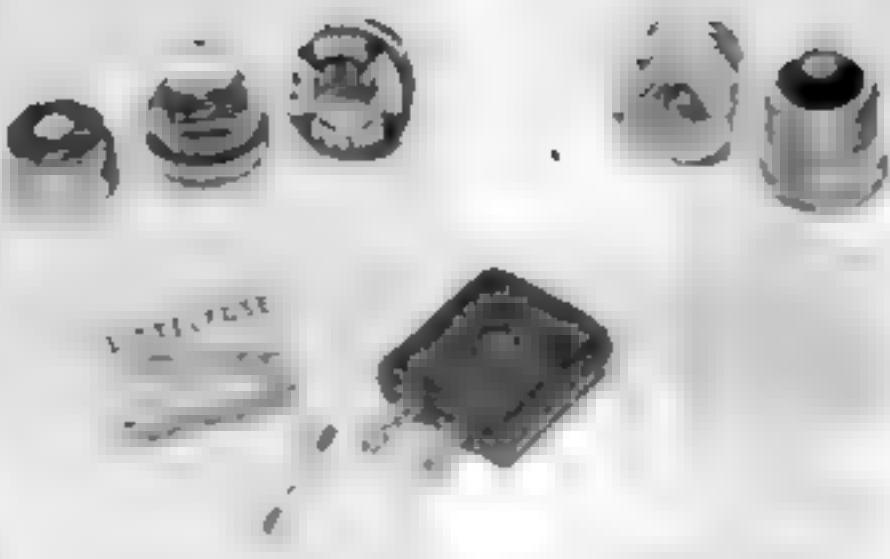
SAFE MOTOR CONTROL is afforded by a fused switch mounted right on the motor. Instead of an ordinary fuse (which would have to be rated for the heavy starting current) use a time-lag fuse rated for the running load; it will carry starting current for a brief time.

squinted at the fuse button. "And to rate a fuse at 6½ amps. Why not 10?"

Cam shook his head. "That fuse has a special job—it's meant to carry just the juice the motor normally needs, and blow if it tries to drag more. With a 10-amp. fuse, seized bearings or a jammed pump could burn out your motor."

"Makes sense," I admitted. "But if this did blow, I'd try a 10-amp."

Bud Nolan shook his head. "The



AN INSERT SOCKET (above left) takes only matching small-body fuses shown beside it; a wire stub makes socket impossible to remove. Time-lag fuses to fit standard sockets (above right) can carry overload briefly. Fused cord plug shown can be attached to any appliance.

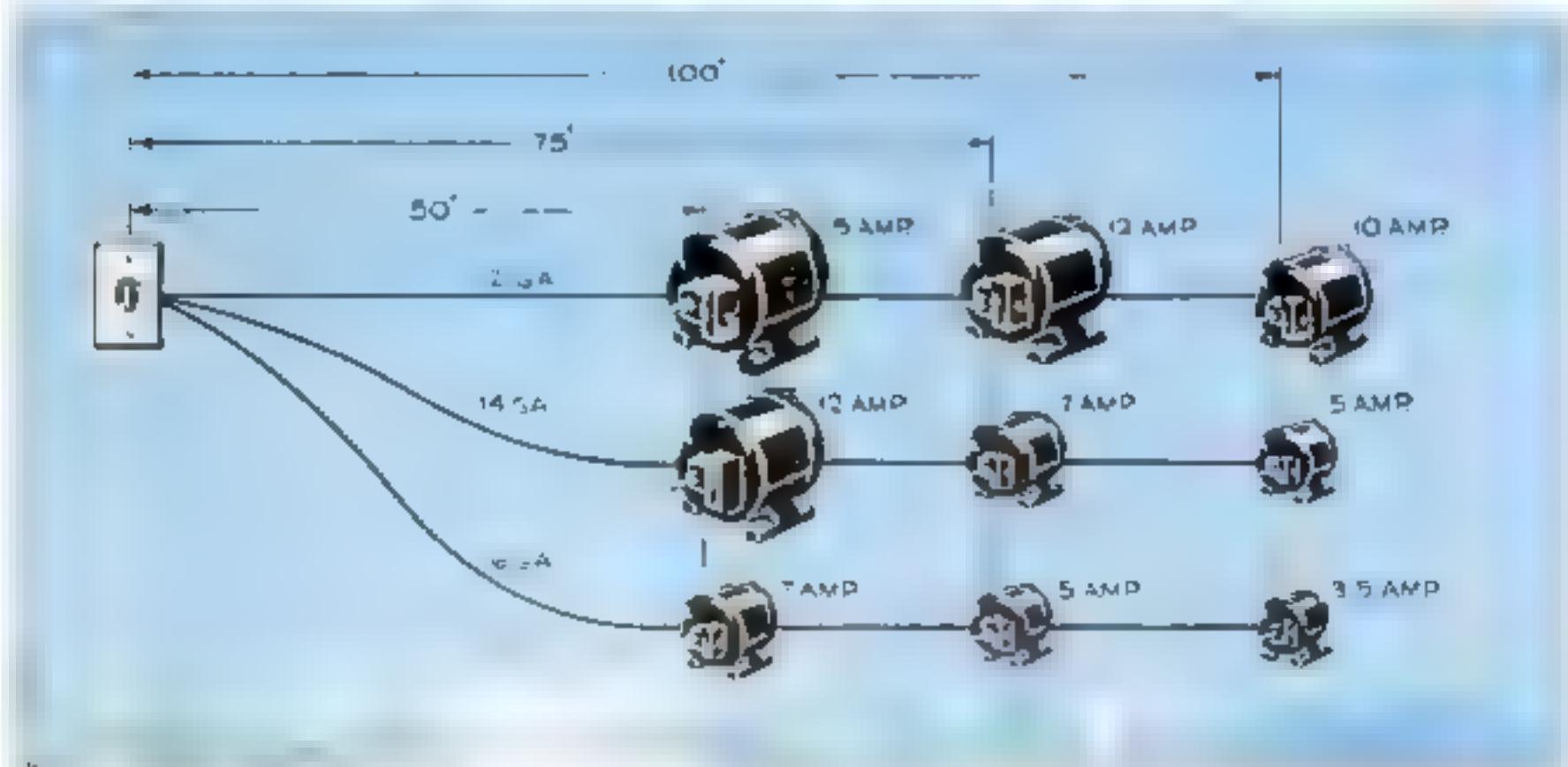
socket it fits will only take a 6½ amp."

"It's also designed so that nobody can put in a fuse substitute," added Cam. "Has your saw blown fuses before?"

"Never in the basement. I moved it outside for this garage job, and plugged into the porch light."

Cam grinned. "You just diagnosed your trouble. That light is fused 15-amps. In the basement you have a 20-amp. line."

The current it can carry drops as an extension cord gets longer



DON'T SKIMP ON WIRE SIZE when you want to pipe power to an electric motor. This chart shows how current capacity of a wire drops as

it is stretched farther from the outlet. Use type SJ cord for moderate duty, type S for heavy service or if cord is subject to oil or abrasion.

"So that's it! Thanks. Will you lend me a 20-amp. fuse for the porch line?"

"No, I won't," said Cam, his grin gone. "Overfusing is bad business. I'll give you a 15-amp. fuse, but you better plug the saw into a 20-amp. line."

I agreed, mildly annoyed. "Good thing I have a heavy-duty extension. I'll run it to the cellar outlet."

My extension proved long enough to reach from the basement to the garage, and the fuse didn't blow. But a couple of times the motor groaned, and I had to feed heavy boards slowly.

By *midafternoon*, as I was taking a break, Cam sauntered over with a couple of boards he wanted to rip. As he lowered them, the ends snagged my extension.

Cam laid the lumber down and carefully withdrew the cord. "Thought you had a heavy-duty extension," he said.

"Sure. Look how thick it is."

"Uh-huh. But you come feel it."

Puzzled, I grabbed the cord, but immediately dropped it. "Gosh, I didn't realize the sun could get it so hot."

"How's the saw doing?" asked Cam.

"Okay, I guess. Hasn't much pep. Say, maybe the connections are loose!"

I picked up the extension socket.

"Better unplug it," Cam advised. "A lawn is no place to check hot wires."

When I *returned* from the basement after pulling the plug, Cam opened the extension's socket.

"Heavy-duty, huh?" he said. "The wire's lamp-cord size. No wonder your saw has no pep and the cord's hot."

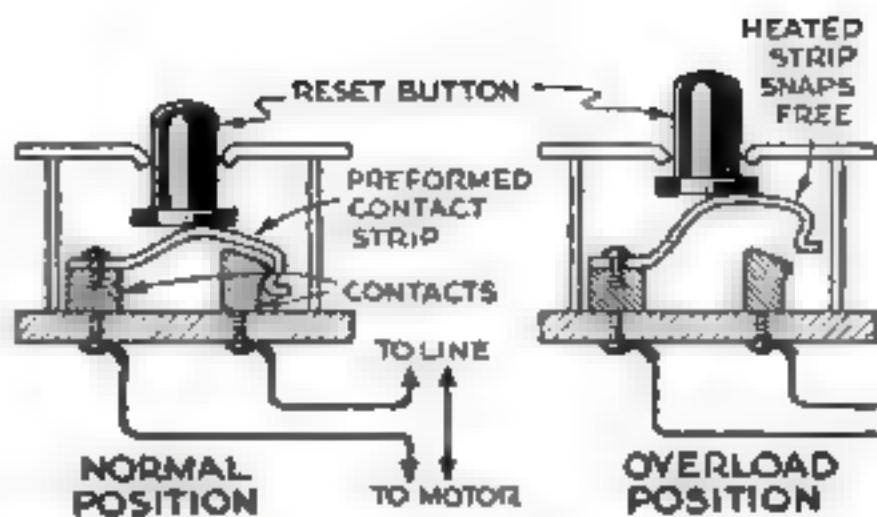
"Look how thick it is," I protested.

"The insulation's thick, to resist scuffing. But insulation carries no juice. This light wire causes a big voltage drop. You may be running your saw on 95 volts instead of 115."

"That couldn't harm it, could it?"

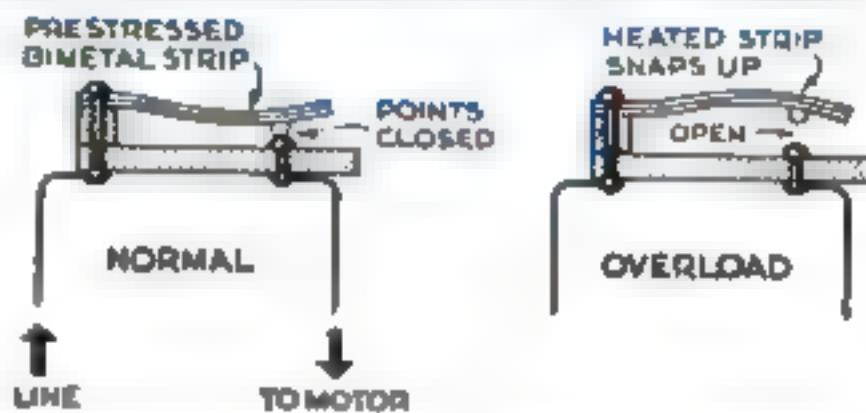
"Sure could," retorted Cam. "Electric power is the product of volts and amperes. Cut the voltage, and the motor draws more amps to lug the load put on it. When it takes more amps than the windings can handle, they burn out."

"But the line fuse would prevent that,"



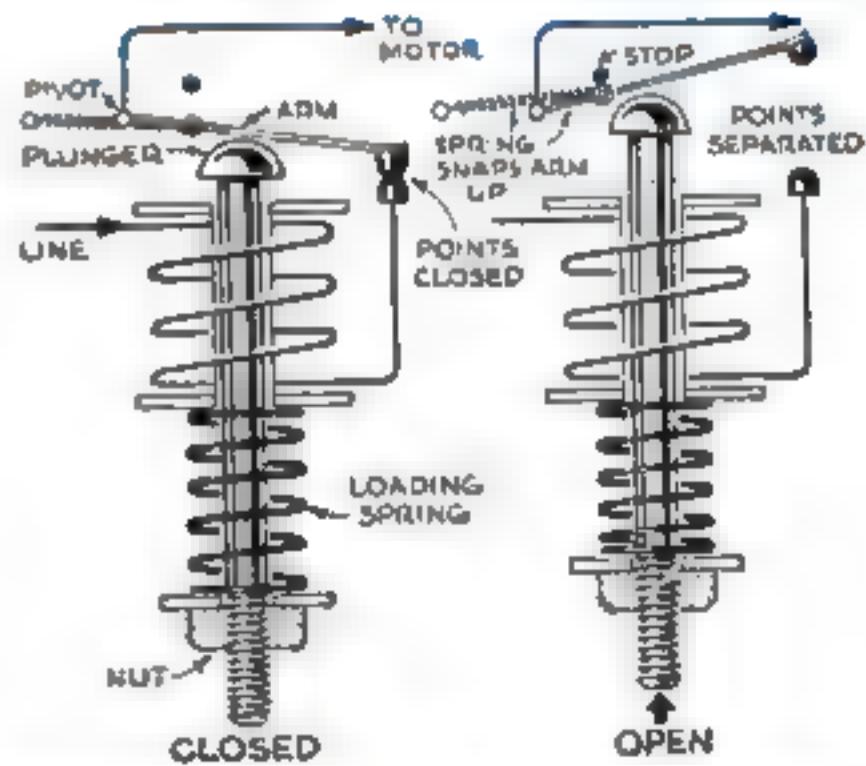
Simple breaker has manual reset

SENSING HEAT both from the motor itself and from the current passing through it, the spring strip snaps off a contact when temperature rises beyond a certain point. After cooling, it can be reset by pressing a button.



Snap-action type resets itself

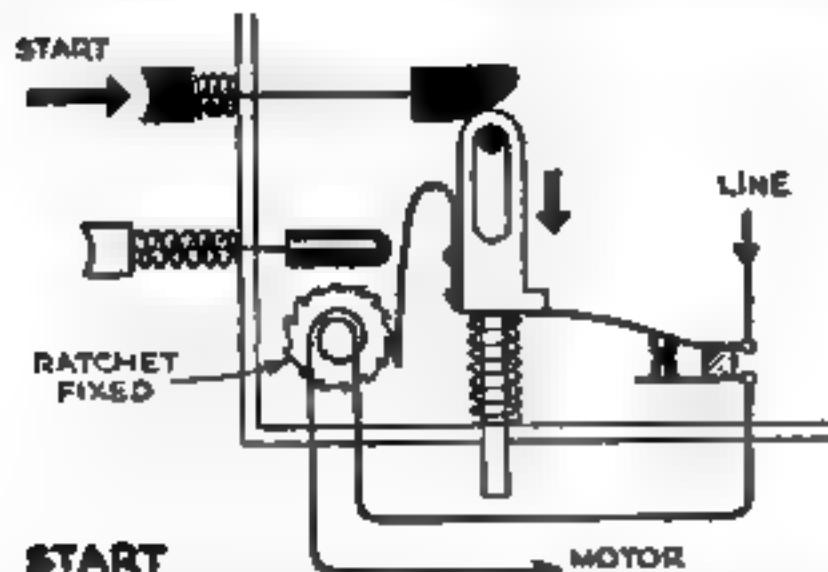
A PRESTRESSED STRIP in this automatic-reset breaker has an action similar to that of a toy cricket. Triggered by heat, it opens the circuit. On cooling, it snaps closed again.



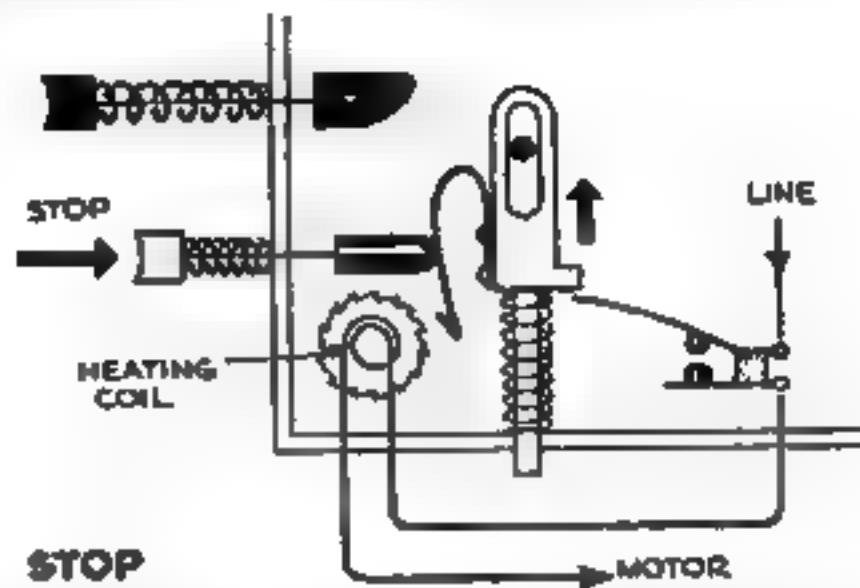
Magnetic trip disregards heat

OFTEN BUILT IN with a control switch, this kind has a solenoid coil through which motor current flows. Tension of plunger spring is adjusted so that only an excessive current will lift the plunger. As it strikes the contact arm, spring-toggle action snaps the points open. They can be reset without waiting for motor to cool.

This push-button motor control includes a heat-operated breaker



BUTTONS NORMALLY START and stop the motor controlled by this device. The shaft of the ratchet wheel, embedded in an alloy-filled



cylinder, normally cannot turn and so holds the contact pawl down until stop button is pressed. But an excessive overload current melts

I protested, pouring Cam a glass of the lemonade my wife had provided.

"Not necessarily," said Cam. "A line fuse may pass enough current to crisp a motor. That's why the special fuse ratings we talked about, and the reason some motors have circuit breakers."

"You mean a red button on one end?"

Cam sipped his lemonade. "The button's what you push to reset the breaker after it has opened. Some breakers are automatic—too much juice, or too high a motor temperature, will open them. When they've cooled off, they close by themselves. But you wouldn't want that kind on a power tool."

Before I could ask why, we were distracted by the sight of Bud Nolan pushing a strange object out of Cam's cellar. It looked like a feed bin on wheels.

"*Bud Nolan's latest gadget*," explained Cam. "He's just put on a second-hand motor he overhauled."

"I'm getting something new, too," I put in, hauling out a catalogue. "Ordered this portable electric saw. Wish I had it. It wouldn't overload my extension."

Cam studied the specs in the catalogue. "Yes it would, Jack. These high-speed universal motors are so compact they fool you. Actually this takes more juice than your table saw—10½ amps."

My face must have dropped. "Relax," Cam said. "I have a good extension you can use right now. I'll ask Bud to get it."

Across the lawn came Bud, pushing his

odd contraption. "There! The Nolan self-propelled lawn sweeper."

"Think it'll work?" teased Cam.

"Wait till the leaves fall, and you'll be asking to borrow it! Course, it hasn't been tested yet. Mind if I hook it up?"

"Be my guest," I offered.

"But first get that extension hanging behind my test bench," said Cam.

Bud tore off in his headlong way, while Cam explained that he had to rip some strips to make a rose trellis he'd promised his wife. He was getting set when Bud came panting back with a heavy cord.

"That socket has three holes," I pointed out. "My saw plug has two prongs."

From a well-supplied pocket Cam took a three-prong plug. "Take it off, put this on, and you're in business."

"Okay. You saw this coming, didn't you?" I grumbled, unscrewing the old plug. "What's the third prong for?"

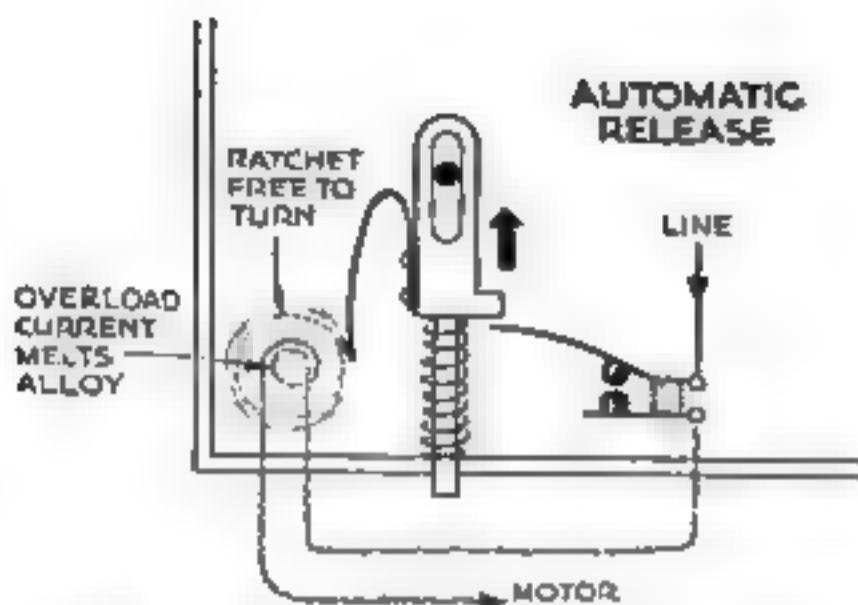
"A ground connection, which is life insurance for you if an electric tool develops an internal ground. Bet your new portable saw has a three-prong plug."

Bud was hopping like an agitated cricket. "Could I hook up my sweeper?"

"Sure, Bud. Go ahead."

I noticed his newly overhauled motor had a three-way plug that fitted the extension socket perfectly.

"Don't forget to clip the ground lead to the BX when you plug in the extension downstairs," Cam warned Bud.



the alloy, letting ratchet slip and the plunger spring open the contacts. They will not stay closed again until the alloy cools and hardens.

Ducking into the cellar and out, Bud almost tripped over his own feet in his anxiety to get back to his machine.

The motor groaned to life as he switched it on, and the thing trundled across my lawn with Bud walking behind. Leaves flew into the container.

"It works!" Bud yelled jubilantly. "Look at it pick up. If that ain't cool—"

A click silenced his triumph. The machine stopped dead. Bud snapped the switch frantically, then reached for the drive belt.

"Hey, Bud. Come here!" Cam called.

Dejectedly the boy obeyed. "It was going fine, Mr. Evans. Why'd it quit?"

"We'll find out," Cam assured him.

"Have some lemonade," I offered.

Bud never drank it. From the lawn came the unexpected clatter of the sweeper, magically sprung to life. We stared as it took off toward Cam's roses.

"Yipes!" yelled Bud, scrambling after the machine in a flurry of arms and legs.

Just as Bud got set for a flying tackle, it stopped dead two feet from the flowers.

Sheepishly the boy turned the machine around, but snapping the switch evoked no life in it. Finally he disconnected it.

"What was that motor you bought originally used for?" Cam asked him.

"A blower or pump, I think. Why?"

"You've just seen a built-in automatic circuit breaker at work," explained Cam. "Also a demonstration of the reason you wouldn't want one on a circular saw."



PORTABLE POWER TOOLS may overheat or burn out either because overloaded, or because underpowered by too long or too light a cord.

"Machines that switch themselves on, I wouldn't want," I said. "But how come?"

"That motor is overloaded," Cam explained. "Excessive current opened the breaker. After it cooled, it closed itself, starting the motor up again."

"And then it quit as soon as it overheated again," finished Bud. "Yeah, I get it. My sweeper's a flop."

"No, Bud. Take the three-inch pulley off the motor. Use a two-incher. And keep that pea-pickin' sweeper out of my roses after this!"

"Gosh! Roger—will do. Thanks."

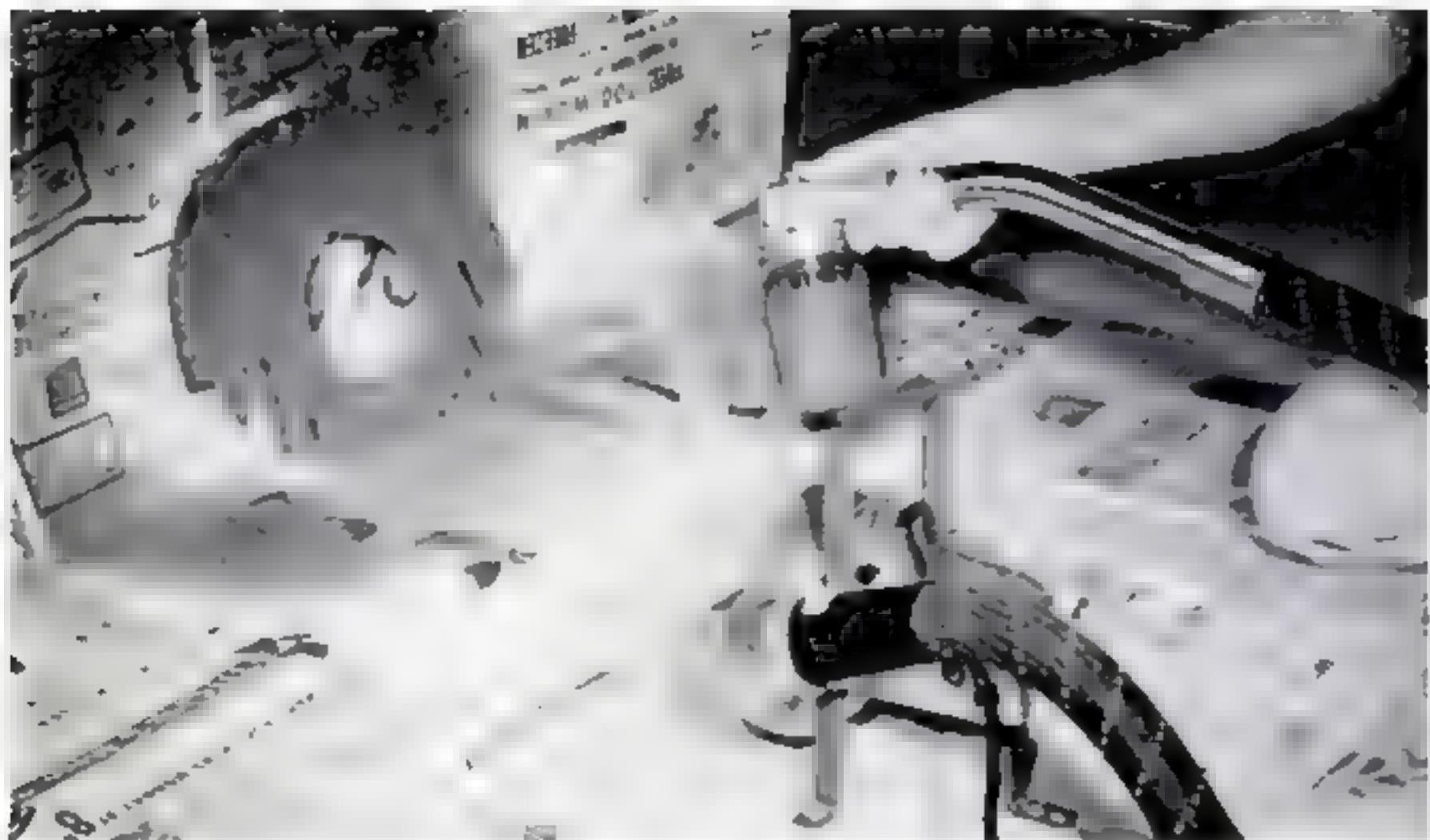
As Bud left, Cam picked up his lumber. I eyed him suspiciously.

"Say, you knew that motor might start by itself. Why did you call Bud away?"

"There was an even chance the switch was on. I didn't want him to have his fingers in the belt if it did start."

"Mm—if it had mowed down the roses, you wouldn't have to build that trellis."

"Believe it or not," said Cam too innocently, "I never thought of that." **END**



Stripped Vacuum Cleaner Runs Shop Sprayer

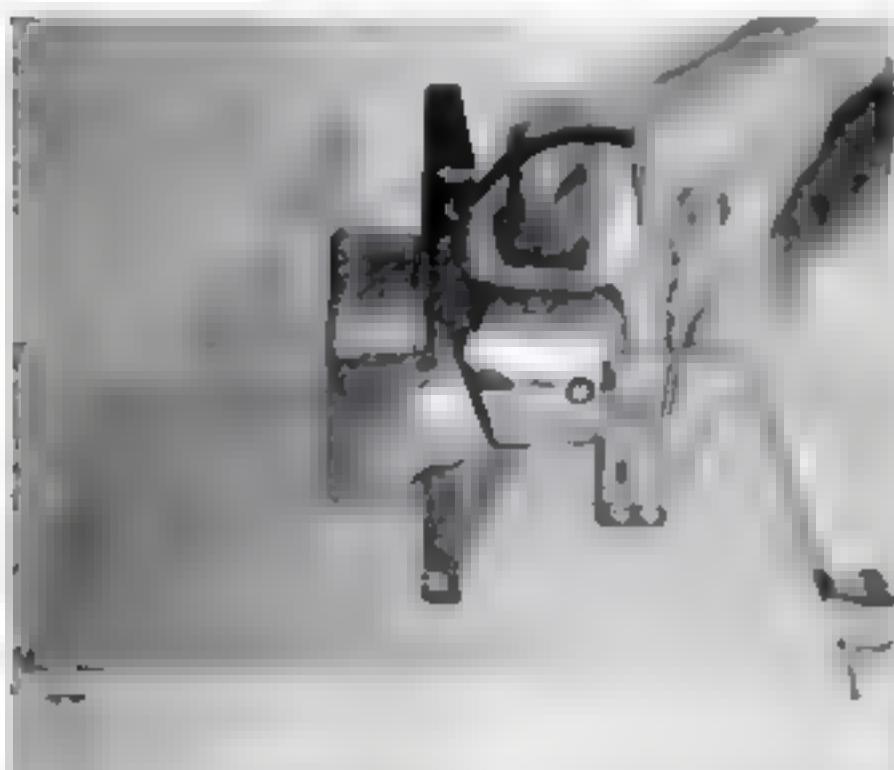
THE paint sprayer that comes as an accessory with modern vacuum cleaners is a handy thing for light spray-painting jobs in the home shop. But you're sure to get in Dutch if you accidentally spray the gleaming vacuum cleaner, too.

I've fixed that. I removed the bag from an old upright vacuum cleaner, taped an air hose to this opening, and now have an efficient blower for use solely with the sprayer. No one cares if it gets a bit of overspray.

Loosening a few screws freed the

motor and impeller blade. I then hacksawed unnecessary parts off the blower housing. Reassembled, the unit was bolted to a plywood base. The air hose I had did not quite fit the blower opening, but a few turns of electrician's rubber tape fixed that.

While my outfit is no substitute for a professional sprayer, it is usually better than a brush. It handles paint and lacquer without excessive thinning. And I can keep my paints in jars and screw on the one I want.—John Rogers.



PLYWOOD BASE, with chair glides for feet, supports unit. Main mounting bracket, screwed to housing, also serves as a carrying handle. It and rear support are the only homemade parts, bent from 3 16"-by- $\frac{1}{4}$ " steel. Air hose was attached to opening where the cleaner bag used to be.



How to Make Your Fireplace Quit Smoking

Chimney ailments are the most common cause. They respond nicely to simple home remedies.

EVEN the best designed fireplace can smoke at times. Whether yours has a constant cough or just an occasional wheeze, the cause can be corrected more easily than you may think. The trouble may be no more complex than:

- An improperly built fire.
- A cold chimney.
- A clogged flue.
- A lack of air.
- A leaking chimney.
- A smothering downdraft.

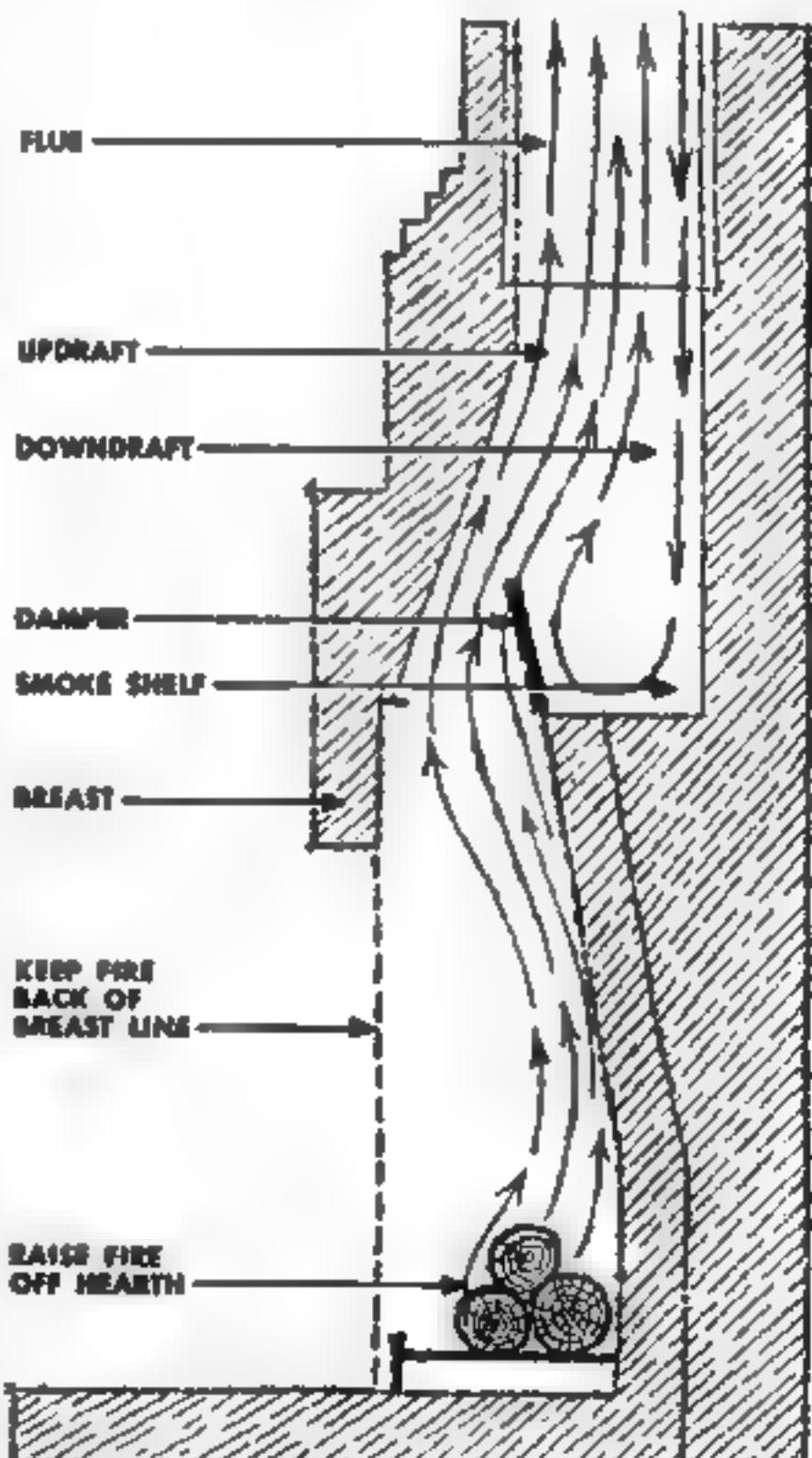
All of these add up to just one thing: your fireplace isn't getting enough draft. Even if the trouble is a basic fault in the fireplace design, stopping these common smoke-makers will go a long way toward helping your fireplace to breathe easier and burn better.

1. Build the fire right. A fire that is set too far forward in the fireplace fails to heat up the rear wall sufficiently. It's this heated rear wall that helps promote a strong draft and sends the smoke up the back of the chimney.

Your fire should be built as close to the back as possible and should not extend farther forward than the inside lip of the masonry overhang in front. Otherwise, some of the smoke may spill out into the room despite a strong draft up the chimney.

The rear wall also acts as the main heat reflector, so that the hotter it becomes, the more heat it throws out into the room.

2. Preheat a cold chimney. To keep



CORRECTLY DESIGNED FIREPLACE shows how important it is to keep damper fully open so that it forms lip on smoke shelf to deflect cold air back up chimney. Without damper or smoke shelf, cold flows down chimney flue and blows smoke out into room, as shown in small sketch at top of page. The fire must be built as far back as possible so that smoke hits the rear wall.



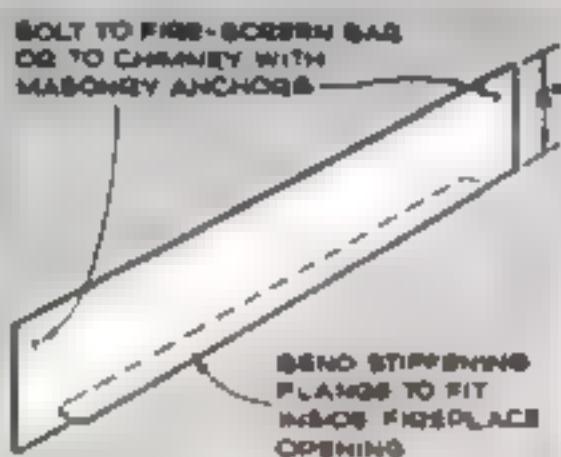
THOROUGH CLEANING is first step in breaking your fireplace of the smoke habit. Remove damper (above left) and scrape off soot and rust. Clean out smoke shelf by hand or with



vacuum cleaner (center) if you have a disposable-bag type that won't be harmed by soot. Dislodge soot from flue by banging insides with a heavy chain or bag weighted with bricks.



REDUCING FIREPLACE OPENING improves draft, can be done two ways. Extra firebrick can be built up along bottom and sides (above left). Lay them in loosely to test amount needed



before cementing. Metal shield across top also cuts the size and helps act as a hood if damper is too low in the chimney. Shield above is made of 1/16"-thick sheet brass 6" wide.

hot air rising and pulling the smoke up with it, your chimney must be warm. That's why exterior chimneys often don't work as well as interior ones—their colder



PREHEAT A COLD CHIMNEY, especially an exterior one, by holding lighted newspapers up flue before you start fire. Pile more papers on top of logs for quick heat to take the chill off.

walls chill the air and slow down its escape out the top.

If your fireplace smokes only at the start, it shows that your chimney needs to be warmed up first. Hold a burning twist of paper right up into the chimney throat. Then when you light the fire, pile more paper on top of the logs to get a good hot blaze going quickly.

3. Clear its throat. Anything that clogs your chimney—a dislodged brick, a damper that's rusted partially closed, even a thick coating of soot—can cut draft enough to cause a fireplace to smoke. Use a long pole to clear obstructions inside the flue. Prune back thick, overhanging tree branches.

You can scrape soot off with a putty knife tied to a stick. If the walls are rough, lower a length of tow chain or a weighted bag and swish it around the

walls to knock the soot off. If the top of your chimney is hard to reach, you can buy a flexible, brush-tipped metal rod to clean the chimney from the bottom.

Scrape the damper clean in the same way, taking it out of the fireplace if yours is the removable kind. Make sure that it opens all the way.

While the damper is out, clean the smoke shelf behind it. This is a projection in the inward sloping back of the fireplace that is designed to deflect cold downdrafts back up the chimney. If it's clogged with soot and fallen bits of mortar, it can't do its job.

If your fireplace has no smoke shelf at all, this lack can be a major cause of smoking. You may be able to have a shelf added if the fireplace isn't too shallow, but this job takes masonry know-how.

4. Give it air. Even a small fireplace requires a tremendous volume of air to keep a good draft going. The larger the opening, the more air you need.

A house that's tightly sealed may not be supplying enough air. Try opening a window a crack, and keep one slightly open in your basement. If your fireplace is in a room shut off from the rest of the house, saw $\frac{1}{8}$ " from the bottom of the doors so that it can draw air more easily from surrounding rooms.

If this still doesn't supply enough air, you can cut down the amount of air that the fireplace needs by making its opening smaller. Raise the bottom line by adding one or two courses of brick over the old hearth. If further reduction is necessary, the sides of the opening can also be narrowed with vertical rows of firebrick. Use heat-resistant firebrick and special fire-clay mortar to cement them in permanently.

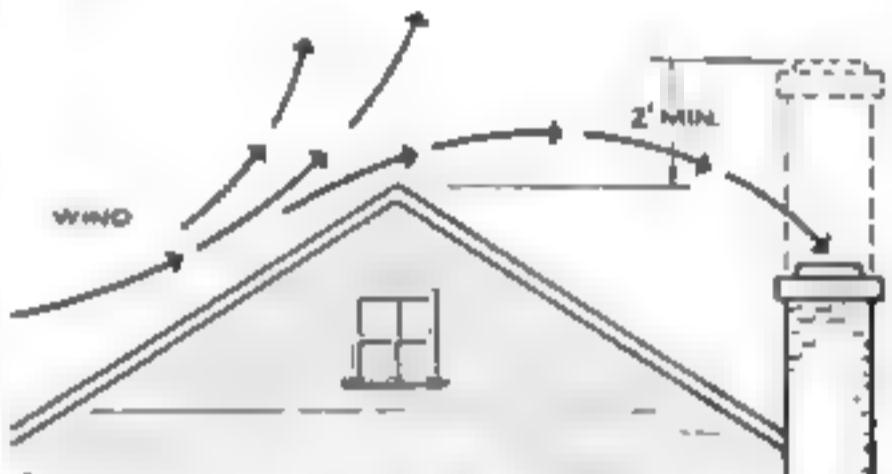
Your damper should be recessed upward 4" to 8" above the top of the fireplace. If it isn't, it may be better to reduce the fireplace opening by lowering the top line instead of raising the bottom. This not only cuts down the amount of air needed, but has the added effect of raising a damper that's set too low.

Experiment by temporarily fastening

[Continued on page 230]



MEASURE FLUE OPENING. Its area (length times width) should be at least 1/12 of fireplace opening. If it's less, decreasing fireplace opening has the same effect as enlarging the flue.



SHORT CHIMNEY scoops in cold air flowing over ridge of roof, causing smoke-producing downdraft, as shown in the sketch. Chimney should project at least 2' above roof top to clear air flow. The chimney above smoked badly until it was extended 4'. Note the slate hood on top, supported on four corner piers of brick, that deflects downdraft away from the flue.

Push-Pull Gas Saw Fells Trees Fast

By E. F. Lindsley

WEIGHING only 25 pounds, a new \$180 gasoline-powered saw works a blade back and forth to cut through 18"-diameter trees like a hot wire hissing through an icicle. I know, because I've just used one of these husky little woodcutters to buck a big supply of firewood.

This push-pull job has a $2\frac{1}{2}$ -horse, two-cycle engine that can scream up to 5,200 r.p.m. Attached to its two-throw crank-shaft are two pistons. One supplies the power and the other, a "coupling piston," shuttles back and forth with a rapier-like blade clamped to it.

One pull on the rewind-starter handle and the engine kicked off like a freshly filled cigarette lighter. Although the saw blade jiggled furiously, there was practically no vibration.

I made a few tentative cuts on a fallen tree trunk. Unlike a chain saw, this reciprocating saw didn't try to pull me

toward the work. All I had to do was to roll the blade gently toward me; its shuttling action did the rest. I followed with some fancy cuts. I notched a log, cut a square tenon, and trimmed some heavy brush. The saw came through with flying colors until I tangled with an old spike.

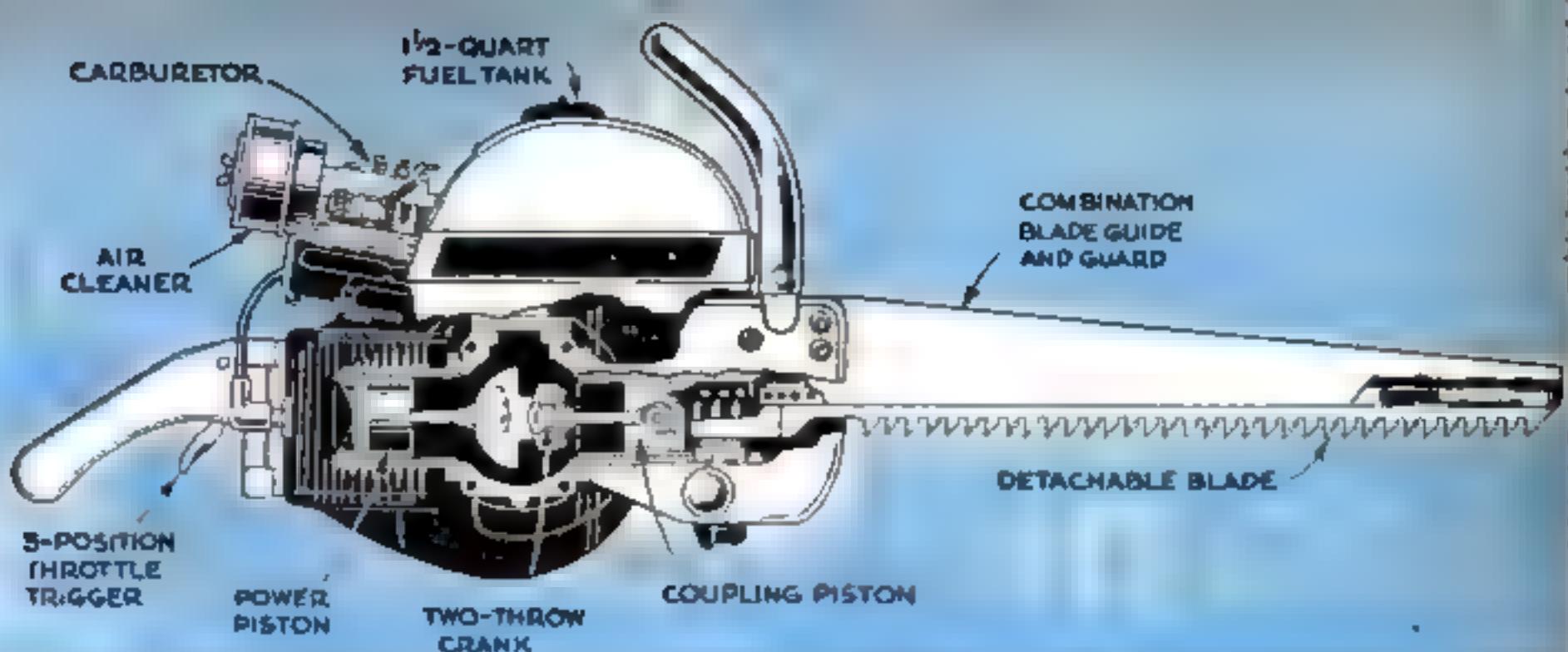
Even then there was surprisingly little damage—it took only a few minutes of straight-across filing to touch the blade up as good as new.

That's one of the big claims made for the reciprocating saw by its manufacturer, the Wright Power Saw & Tool Corp., of Sheboygan, Wis. If you walk the blade into some hidden menace, only a few teeth are bunged up. With a chain saw, all of the dentures get the works.

Although not intended to replace the big chain saws used in heavy logging, this little woodcutter will hold its own and better in pulpwood operations, or wherever logs of up to 18"-diameter are being handled.



INSTRUCTIONS SAID not to shove the blade into the wood like a chain saw, but to draw it lightly toward me, starting from the far side of the desired cut. I felled this tree so fast I had to drop the saw to scramble clear. A handy safety feature shut off the engine instantly. That was the three-position trigger control. Squeezing the trigger revs up the engine. Shoving it into a forward notch gives idling speed. Full release cuts the ignition.



CUTAWAY DRAWING of the Wright gasoline saw shows how the dummy coupling piston gives a reciprocating action to the blade, which can

be removed in 30 seconds for resharpening. The bearing surfaces in the blade guide are silver-plated to provide oil-less operation.



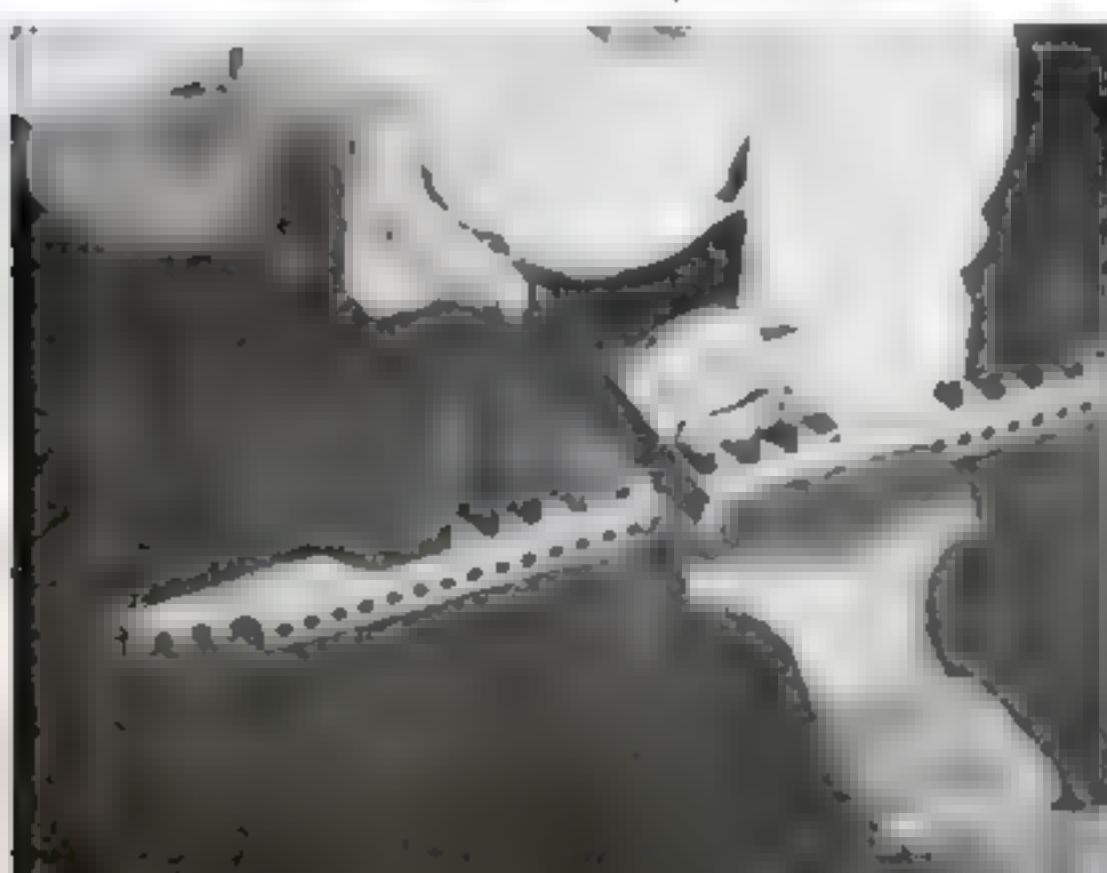
MY WIFE bucked some winter firewood—showing that neither extra strength nor special skill is needed to handle the 25-pound saw. Smooth cutting action makes this possible, although not necessarily popular with the ladies.

TO SHARPEN THE BLADE, I simply drew a file against the face bevels of the teeth until the points were restored. I used a specially contoured Wright file whose smooth lower edge couldn't cut into the body of the blade.



A TUB ON THE KNOB just below the forward saw handle releases the blade for sharpening or replacement. A blade is good for more than 100 hours' use with normal care and occasional sharpening. Blade replacements cost \$9.85.

RECIPROCATING SAW is husky enough for heavy commercial work as well as amateur use. It follows a straight line without wandering, leaving a mill-edge on heavy lumber or timbers. The saw cut is only $3/16$ " wide. **END**



New for Your Car

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1. Spray Cleans Engine. With this spray-can degreaser, you can get to hard-to-reach parts around a car engine or other machinery. Its spray is said to remove grease and other dirt without need of steam cleaning. Parts that must be protected, such as the carburetor, can be covered with plastic bags as in photo at right.



2. Travel Diary Clips to Visor. Clip this diary on a car visor, and you can keep an on-the-spot record of expenses and other trip data. The knobs turn a paper roll designed to take a year's entries. A refill roll comes with the diary.



3. Throw-Away Towels Clean Car. You can give your car a quick clean-up with these sturdy paper polishers, and then just throw them away. Requiring no water, the silicone-treated towels also clean chrome trim and interior metal.



4. Gauge Checks Brake Fluid. Loss of a car's hydraulic brake fluid shows at a glance on this gauge attached to the firewall. The glass reservoir holds extra fluid, and is connected to the master cylinder with a hose. If fluid shows here, the brake supply is okay. When more fluid is needed, you can add it through the reservoir. A choice of two kits fits all standard-make cars using hydraulic brakes, except a few with cylinder dipsticks.

More information about these products can be obtained from:
1. Plasti-Kote, Inc., 9801 Harvard Avenue, Cleveland, Ohio;
2. The Idea Treasury, 709 Webster Avenue, New Rochelle, N.Y.; 3. Martin's Box 151, Forest Hills 75, N.Y.; 4. Safety Gauge Co., Box 66, Albany 6, Calif.

Queer-looking blemishes often spoil a brand-new furniture or auto finish if old silicone polish is left on the surface. You can remove them easily if you know

How to Foil Fish-Eyes



THE silicone polishes now used on cars and furniture are so good that they make trouble when you try a refinishing job—or even touch-ups.

Silicone makes excellent polish because dirt won't stick to it. But neither will paint, varnish or lacquer. If so much as a trace of silicone is left on the surface to be refinished, you'll get blemishes called "fish-eyes" and "craters," which is just what they look like.

Several methods have been worked out to help you clean off old silicone and avoid refinishing difficulties.

Refinishing furniture. Wood is the toughest to clean because silicone seeps into its pores. Scratches and gouges collect pockets of polish and carry it deep into the wood. When you put on a new finish, the solvents in the finish draw the silicone to the surface and cause the bubblelike fish-eye.

After you have removed the old finish, carefully wash the bare surface with turpentine to draw the silicone up and out. If you have used varnish remover, repeat the washing. Change to clean cloths frequently so that you don't end up by

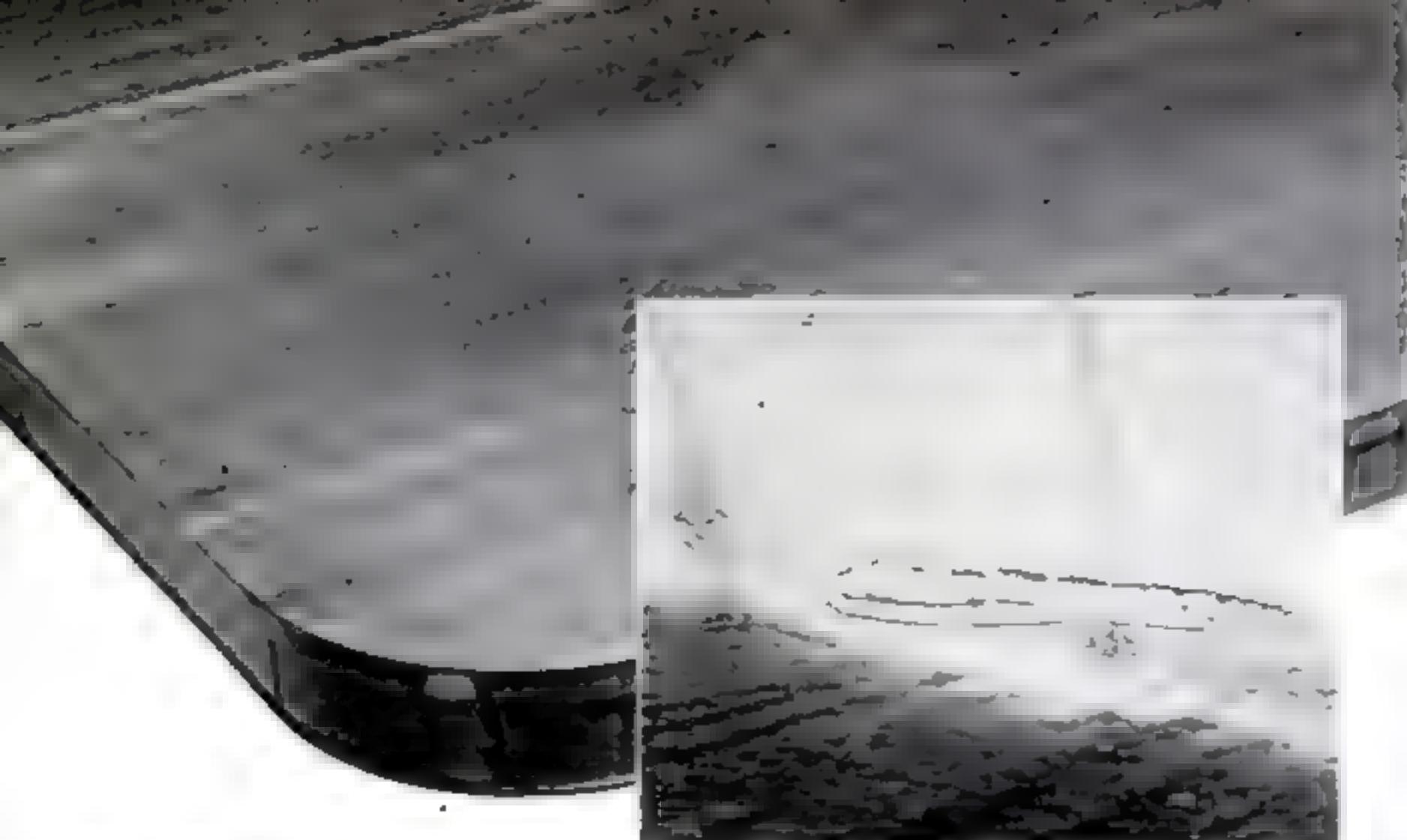
wiping the picked-up silicone back on.

You shouldn't have any trouble with a varnish finish if you first seal with shellac. Lacquer finishes may be a bit more bothersome. On open-grain woods, use lacquer sealer for your first coat, then watch for fish-eyes. If any appear, remove the sealer immediately with lacquer thinner and repeat the washing with some turpentine.

If you keep getting fish-eyes, you'll need to put on a barrier coat. This is a special chemical that mixes well with both the silicone and the lacquer, providing a bond between the two. It's especially good for carved wood and other intricate shapes that may be hard to clean out thoroughly.

The barrier chemical must be sprayed on in a single light coat at 55 pounds' pressure, then allowed to dry 15 to 30 minutes. Sand only if necessary and then very lightly so that you don't break the "skin." Put on the usual coat of lacquer sealer, and follow this with two coats of lacquer.

Cleaning auto bodies. Metals are easier to clean because not even the most



BIG CRATER (inset) spoils your work when traces of silicone polish prevent a new finish from sticking to the surface. The small pocks around it are fish-eyes. If you try to cover them by adding

more coats, you just make them wider and deeper. When the old silicone polish is thoroughly cleaned off, the new finish flows on smooth and gleaming, as at top above.

determined silicone can penetrate as deeply as it can in wood. However, a car's mirror finish makes even the tiniest flaw stand out so it looks like a mountain.

The trick is to get the old polish off without further contaminating the surface with it. Start at the top and work downward, using a solvent wash. If you are retouching only a small area, clean a larger section around it.

The best solvents to use are turpentine, toluene or carbon tetrachloride.

Paint thinner, white gasoline and naphtha will not work as well. You can also get special silicone removers that can be used in place of the ordinary solvents on either cars or furniture.

After you have buffed or sanded the damaged area, carefully blow—don't wipe—the dust away from the surface. Repeat the solvent wash twice more, switching frequently to clean cloths—especially important when you're washing a large area—as you work.

If fish-eyes still show up as you apply the new finish, you can follow the method used in many professional shops. Remove what you have started to put on, then add a small amount of methyl silicone fluid to the new finish—an eyedropperful to each pint. Do this for each coat that you put on. The fluid is available at auto-body shops or from the manufacturers listed at left.

When you are all done, you can put back that silicone polish to give your new finish a sleek, durable gleam. But wait at least a day, on either cars or furniture, to be sure that the finish is thoroughly dry, before you put the polish on top of it.—*Darrell Huff*.

Where to Buy Refinishing Aids

Some of the special products mentioned on these pages are listed below. If they are not available locally, they can be obtained from the manufacturers.

Barrier coats: Star Chemical Co., 9830 Derby, Westchester, Ill., and Silicone Lock-Seal, Behlen Brothers & Co., 10 Christopher St., New York 17, New York.

Silicone remover: O-K Silicone Polish Remover, Sherwin-Williams Co., 101 Prospect Ave., N. W., Cleveland, Ohio.

Silicone fluid: Marson Corp., Revere, Mass.; Walbern Laboratories, Decatur, Ill.; Liquid Glaze, Inc., 704 Sheridan St., Lansing 6, Mich.



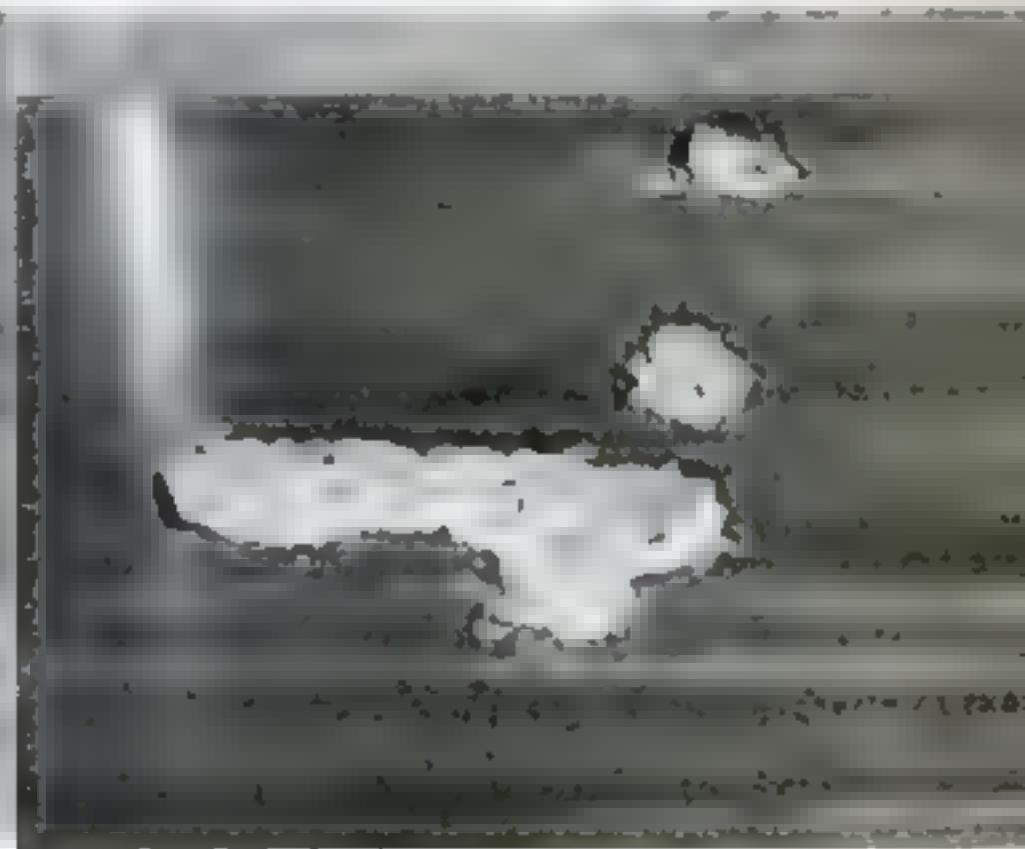
STRIP OFF OLD FINISH with long strokes so that silicone in the scrapings won't fall on cleaned areas. Masking tape around the edges keeps the drippings from running down the sides



SCRUB SURFACE WITH SOLVENT as soon as old finish has been removed so that traces of silicone polish will not seep into the wood. If you have used varnish remover, wash it twice.



SCRATCHES AND CIGARETTE BURNS, like those above, trap old polish deep in the wood and require a poultice to draw the silicone out. Make a paste of turpentine mixed with fuller's earth,



pumice or rottenstone and spread it over the scratches, as at right above. Let the mixture stand until dry—two to three hours, then scrape it off. Remove wax polish the same way.

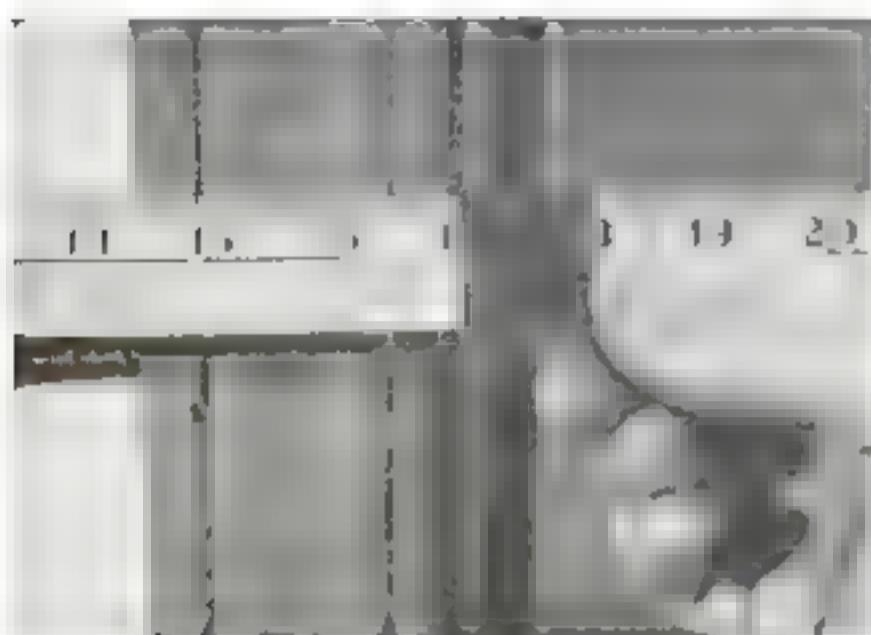
POWER SANDING is faster than hand sanding, doesn't let contaminated particles lie on the surface as long. Blow the saw dust away frequently—don't grind it back into the wood



NEW FINISH SHOULD LOOK LIKE THIS—dull, but smooth and free from specks or pocks of any kind. You can rub it to the desired sheen with pumice or rottenstone wet with naphtha. ESD



New Shop Ideas

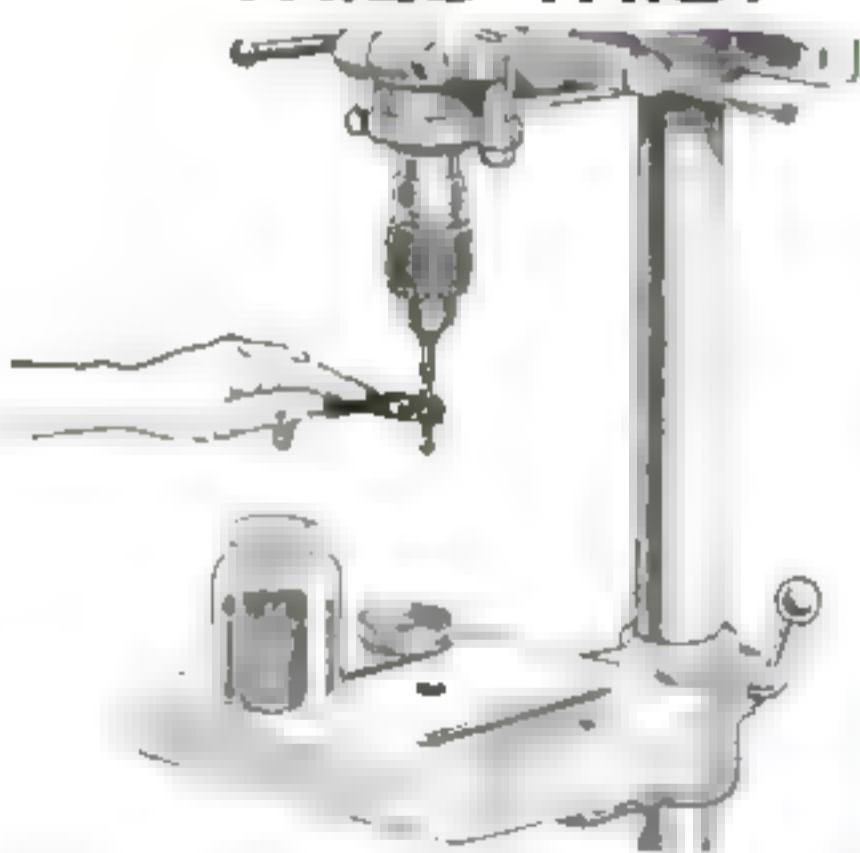


Yardstick That Remembers. Fit a yardstick with a metal slide and you can transfer exact measurements from one piece of work to another without remembering complicated figures or computing fractions. The slide is a strip of tin-can stock bent around the yardstick tightly enough to stay in place. You could also make one to slide on a steel tape.



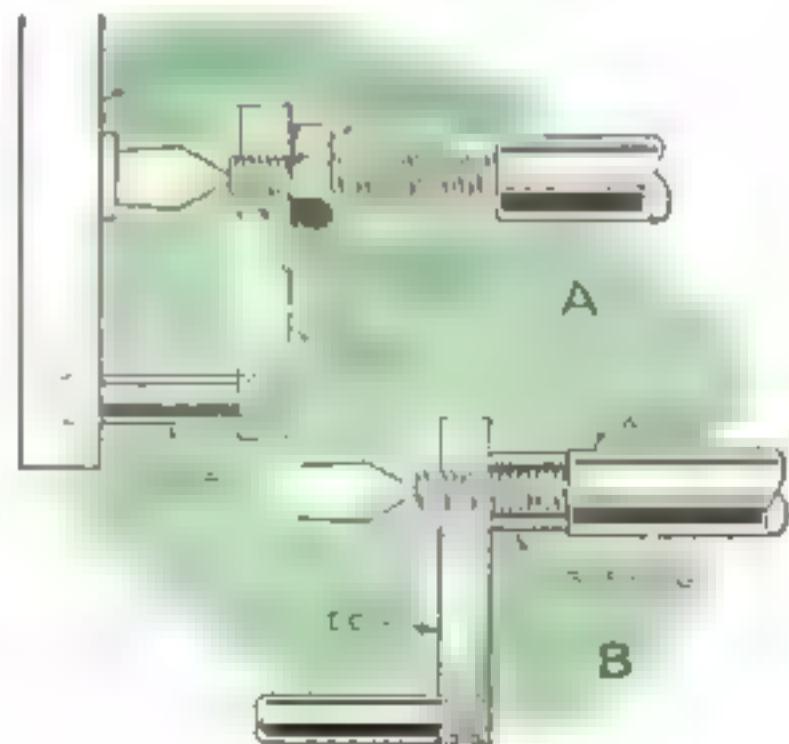
Lotion Dispenser Squirts Oil. A hand-lotion bottle with an L-shaped plunger dispenser will put small amounts of oil in places that are awkward to reach into with an oilcan's spout. If the dispenser is too short for the job, you can easily lengthen it by slipping a section of soda straw over the plastic nozzle.—Howard R. Schramm, Shadyside, Ohio.

HAVE YOU TRIED THIS?



Bacon Fat Aids Machining. Bacon fat makes excellent cutting oil. Applied with an old toothbrush, it melts from the heat of the drill or cutting tool. Try it for drilling, turning and threading. Keep the fat in a covered can to discourage mice.

Lathe Dog Won't Bite Threads. The ordinary lathe dog will mar threads, but one made as shown will drive threaded work without risk of damage. It can be made of $\frac{1}{8}$ " flat steel for light work. Cut a length that suits the faceplate driving slot. Drill and tap it at one end to thread onto the work, and at the other to fit the tail, made of $\frac{1}{8}$ " rod and threaded. Clamp the dog against a lock nut as at A, or a slip-on bushing as at B.—C. W. Woodson, East Aurora, N. Y.





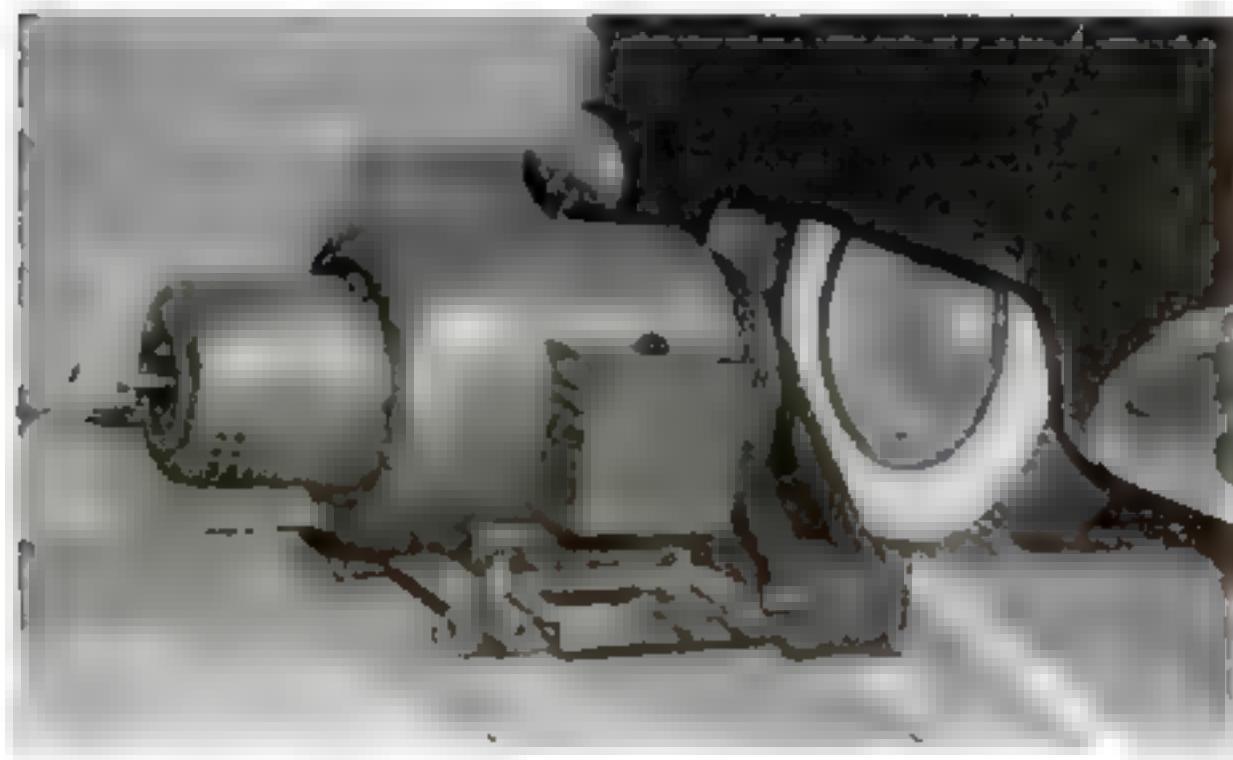
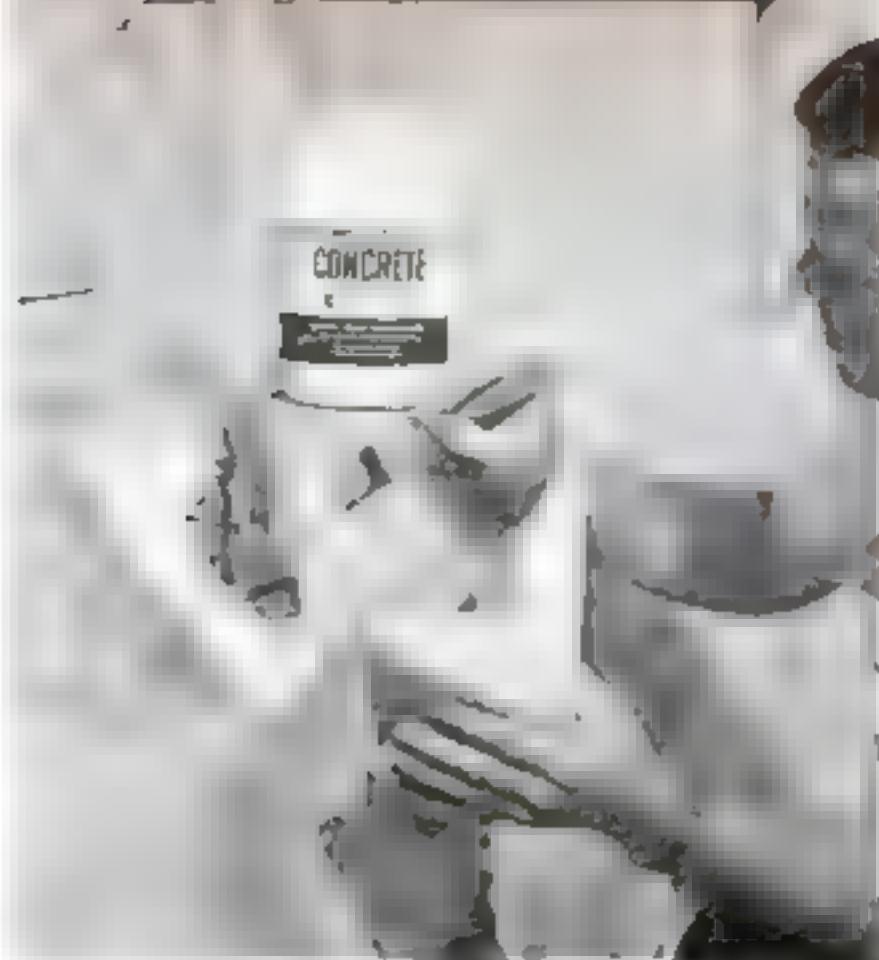
Gauge Sets Cutter. You can set a hole cutter quickly by sliding it along the teeth of this scribed hacksaw blade. Drill a hole for the bit (heat the blade first), then scribe lines every $\frac{1}{8}$ " or $\frac{1}{4}$ ". If a line doesn't coincide with a saw tooth, grind in a notch. Fill the line in with chalk.

Flag Safeguards Jigsaw. A jigsaw is one of the safest tools to start youngsters learning on, but it can still nick unsuspecting fingers. A strip of brightly colored cloth or ribbon tied to the blade will remind users to keep their hands away.

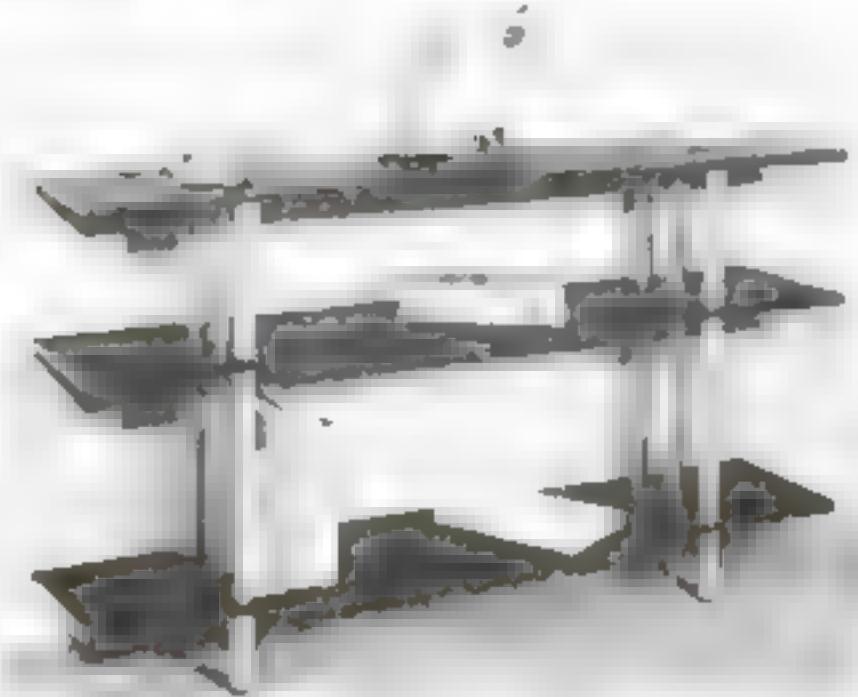
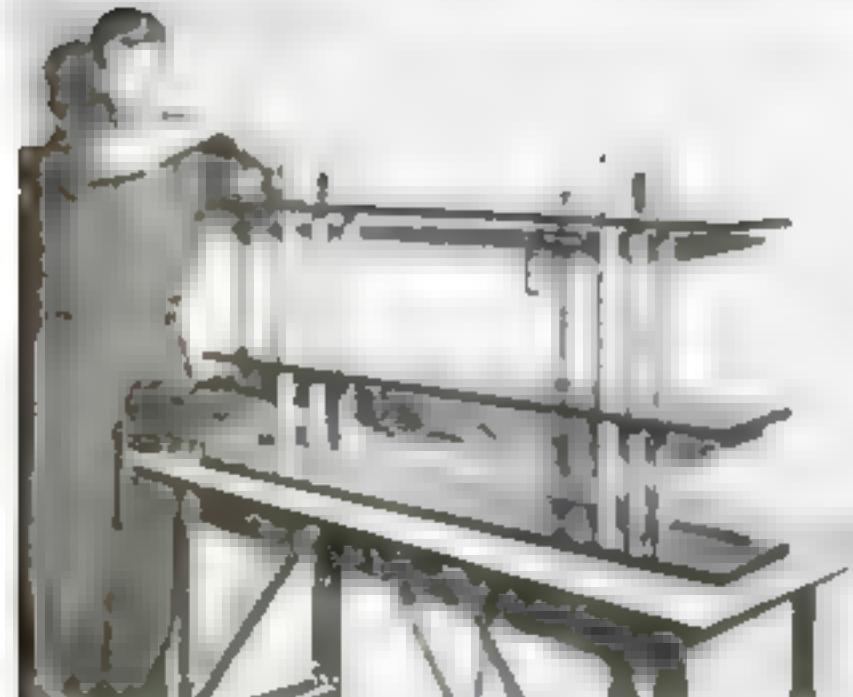


New for the Handyman

1. Glue Mends Concrete. A chunk of concrete that has broken off a step or wall can be glued back on with this new adhesive. You can also use it to bond new concrete to old, metal to concrete, and to surface old wood floors with concrete. A companion cement is available for use as a topping with the glue.



2. Car Runs Generator. Back a car or truck up on the treadmill behind this ramp and its engine delivers electricity in emergencies. The wheels turn rollers connected to a 110/220-volt generator that puts out 10 kilowatts. The car engine is run at constant speed to keep the current output at a frequency near 60 cycles.



3. Aluminum Posts Build Furniture. These 1½"-diameter aluminum posts make it easy to assemble tables, bookcases and other pieces of modern furniture. The posts can be attached to wood

from $\frac{1}{2}$ " to 1" thick with short, concealed screws for end mounting, or with long screws that pass through the wood and join additional posts. Legs come 4" long and the posts 4", 9" and 12" in length.

More information about the products above can be obtained from: 1. Red-E-Crete, Inc., 1001 Aviation Dr., Glendale, Calif. 2. Auto Engineering Co., 1815 First Ave., Mankato, Minn. 3. Consolidated Aluminum Corp., 241 Shoreland Bldg., Miami.



Three posts supporting a simple row of rafters make it easy to add an outdoor room like this.

The ABCs of Building a Roof *for just about anything*

By David X. Manners

THE roof is often the toughest part of building a garage, porch or new extension on your home. But it needn't be hard if you follow these step-

by-step construction photos, from A to Z.

The pictures show the simplest kind of roof that you can build—one that slopes in only one direction. It has no complicated gables, hips or valleys to frame, no angles to cut, nothing that

FOUR-BY-FOUR POSTS are anchored to foundation by drilling concrete for bolts. Use hammer and star drill to cut $\frac{1}{4}$ " holes 2" deep at corners and 8' apart in between.

DRILL ENDS OF POSTS to take $\frac{1}{8}$ " lag screws 4" long. Turn screws in halfway, leaving 2" to project into the concrete. Insert 8" squares of sheet copper for moisture shields.

BEFORE YOU CUT POSTS to exact height, set the two end ones temporarily in place. Use scrap lumber to form tripod braces and plumb each post in both directions.





D CHECK PITCH OF ROOF by stretching a two-by-eight across the two end posts and resting a trial rafter on it near one end. House rafters are exposed by removing trim board.



E WITH ONE END at correct height, level beam carefully and clamp opposite end to other post. Then set all posts in place, mark their height, and saw them to the correct length.



F CEMENT POSTS in permanently by placing mortar in holes and on ends of lag screws. Wet down the holes, set posts in place, then brace them plumb until the mortar has set.



G INNER ENDS of rafters are side-nailed to exposed ends of house rafters. Use two-by-six rafters for spans up to 12' (not counting overhang); two-by-eights for spans up to 16'.



H OUTER ENDS of rafters are toenailed into beam from both sides, using 10-penny nails. In ordering length of rafters you need, be sure to allow for overlap at house and overhang.



I NAIL ON one-by-six sheathing with eight-penny nails where each board crosses a rafter. Start boards at house to insure a good fit and work downward, staggering end joints.



J CORRECT ANGLE for making face board meet house roof is found by tacking the board up temporarily. Then hold scrap board against house and draw a parallel line on the face board.



K NAIL MOLDING TRIM to top edge of face board, matching that used on house. Leave both boards extra-long for cut-off later. Use galvanized or aluminum nails to prevent rusting.



L HORIZONTAL STRIPS are nailed to sides of overhanging rafters to level underside of the sloping edges. Use one-by-threes, leveled flush with lower tip of the rafter ends.



G BEND UP THE EDGES of the copper shields around the sides of each post and caulk the seams to keep water out. The shields protect the posts from rot and termites.



H RAFTERS MUST BE NOTCHED to rest flush on beam. Cut a stick to match depth of notch needed and draw line on rafter. Beam is made up of two two-by-eights spiked side-by-side.



I CUT FIRST NOTCH and use it as guide to mark notches in other rafters. Rafters will sit slightly lower after notching, so be sure to allow for this if the pitch of the roof is critical.



M EASIEST WAY TO TRIM roof boards is all at one time when sheathing is complete. Mark cut-off line with a long, straight board and use a portable power saw if available.



N HOLD LEVEL VERTICALLY to provide a plumb line for cutting off the rafter ends square. Width of overhang on new roof should match that of main house roof to keep same style.



O IF SHEATHING OVERHANGS rafters at ends, add one-by-two batten strip to provide lower nailing surface for face board. Set strip out on blocks so that it's flush with the sheathing.



S BOARD TO ENCLOSE overhang of roof, called soffit, is nailed to the horizontal strips on the rafter ends. Prop, seen in background, helps hold board in place while you nail it.



T FACE BOARD on edge of roof is nailed to ends of rafters and, in between these, to edges of sheathing and soffit board. Nails in soffit will help you locate the ends of the rafters.



U LAY DOWN STRIPS of 15-pound felt over roof sheathing, but don't nail them. Start first strip at outer roof edge and lap each higher one over the next lower one 8" to 10".



ROW OF WOOD SHINGLES, projecting $\frac{1}{2}$ " beyond roof edge, provides stiffening for first row of asphalt shingles that also overhang $\frac{1}{2}$ ". You can lay them without nailing.



ASPHALT SHINGLES must be started at outer edge of roof, but can be adjusted as you near existing shingles so that rows will come out even. Use $\frac{1}{2}$ " overhang at ends of roof, too.



ATTACH SHINGLES with galvanized roofing nails through part that laps under next row. To adjust spacing, move rows closer, not farther apart than minimum overlap.



LAST ROW of shingles is tucked up under old shingles and nailed to house roof. If this causes the old shingles to curl up slightly, fasten down the edges with roofing cement.



CEILING of $\frac{1}{2}$ " plywood encloses underside of rafters. If roof is for a future room, add insulation batts first. Where looks and heat don't matter, you can leave rafters open. If roof must be fastened to side of house, remove strip of siding to expose wall studs. Nail rafters to the sides of the studs and fasten a one-by-four "ribbon" board under them for added support.

takes six hands to hold while you are putting it together.

The easiest way to put up a single-slope roof is to hitch one side to your house, requiring only an outer wall or row of posts to support the other end. Then you can leave it open for a carport or porch, add screens or glass, or perhaps later enclose the sides to make a room.

If your present roof isn't too steep, you may be able to continue the same slope, carrying out the lines of the house. If you have to change the pitch, as shown here, don't make it any flatter than

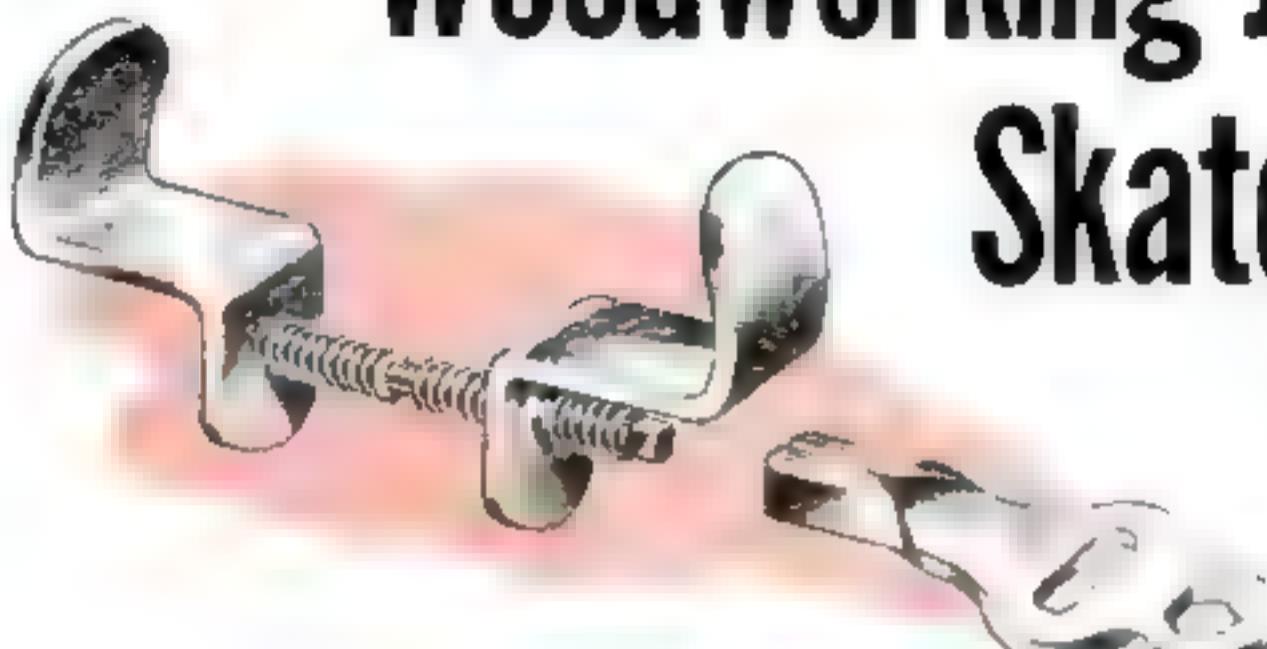
you have to. Conventional asphalt shingles require a comparatively steep pitch for watertightness, and the special shingles you may need for flatter roofs are more expensive.

The concrete floor for the porch shown was made by building up a low perimeter wall of masonry blocks set on a concrete footing below the frost line. The center was then filled with a bed of cinders and a layer of concrete poured on top. If your structure is to have no walls or floor, you can support the posts by putting in individual concrete piers.

END

How to make three precision

Woodworking Jigs from Skate Clamps



By Edwin M. Love

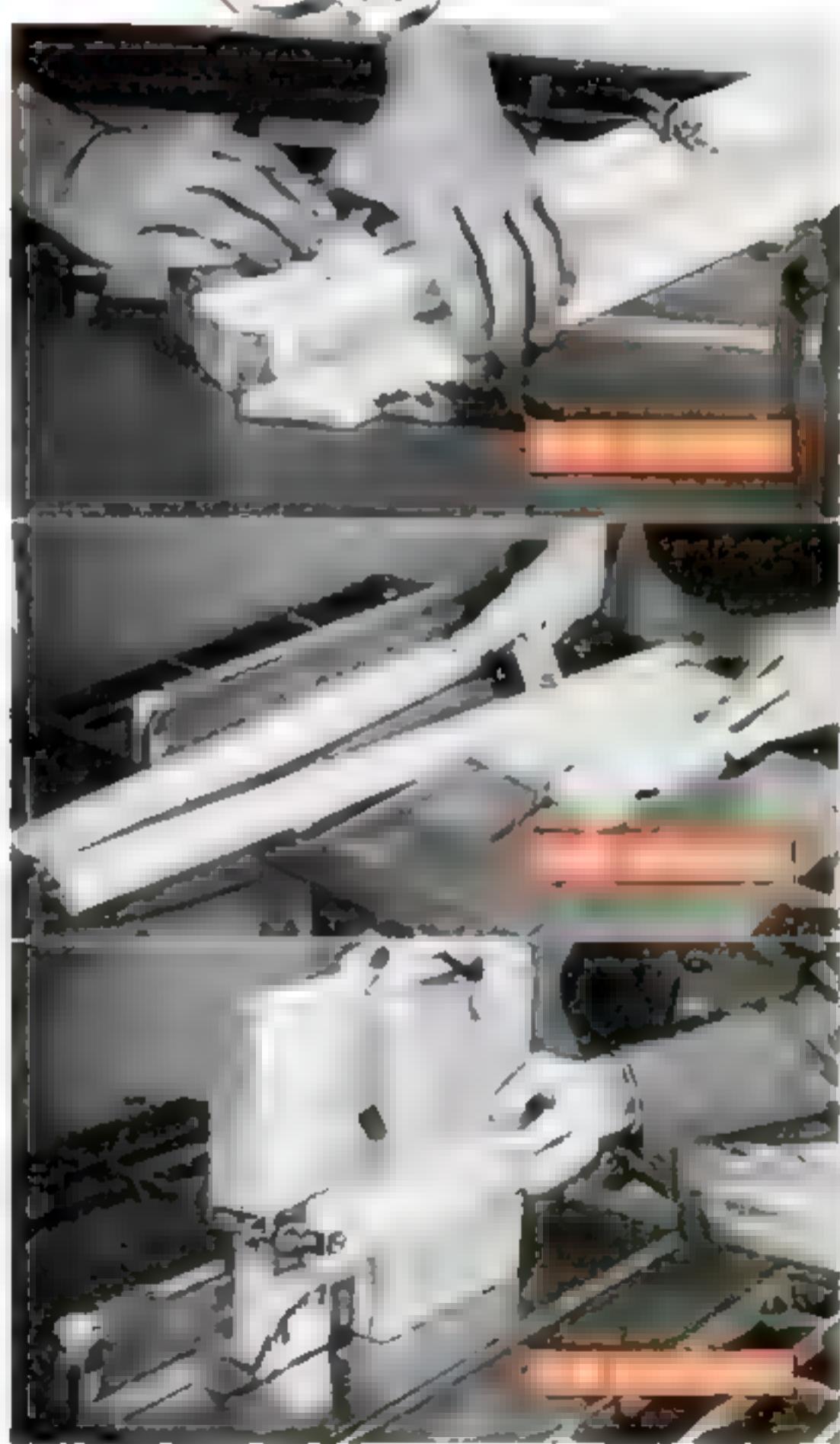
FOR less than a quarter, in most hardware and toy shops, you can buy one of the neatest little screw adjustment devices ever invented. It's the roller-skate clamp that pinches onto the skater's shoe sole.

A turn of the skate key moves the two parts about $3/32''$; a tenth of a turn about $1/100''$. Mounted on the movable parts of homemade power-tool accessories, the clamps provide almost micrometer adjustment. As screw action is irreversible, they won't slip once set.

Skewed to fit shoe tips, the brackets of the clamps can be straightened or reshaped by hammering them in a vise (avoid bending more than once on the same line). They can be drilled for mounting screws or bolts.

Finish the wooden parts with shellac or penetrating floor sealer.

Caution: The saw guard has been omitted in the photos for clarity. Use it with all but the tenoning jig.



THE BARS ARE JOINED by a spring-metal strap. This gives hinge action without any slack, which is an advantage over the conventional pin hinge.

Miter-Gauge Extension Has Vernier Adjustments

TO SET STOP RODS for cutting pieces to duplicate length, clamp rod carrier with wing bolt (not shown here) on bars. Lock rod at approximate position with the wing nut (arrow). Make the final adjustment with the skate clamp as shown.



A TWIST on the skate clamp fitted to this miter-gauge extension will set an angle precisely right, sharpen or flatten a miter to fit a corner that is a bit off square, or offset the variation in an angle cut caused by the tendency of work to creep into the blade. A similar skate-clamp vernier sets the stop rods to a nicely for duplicate cutoff work.

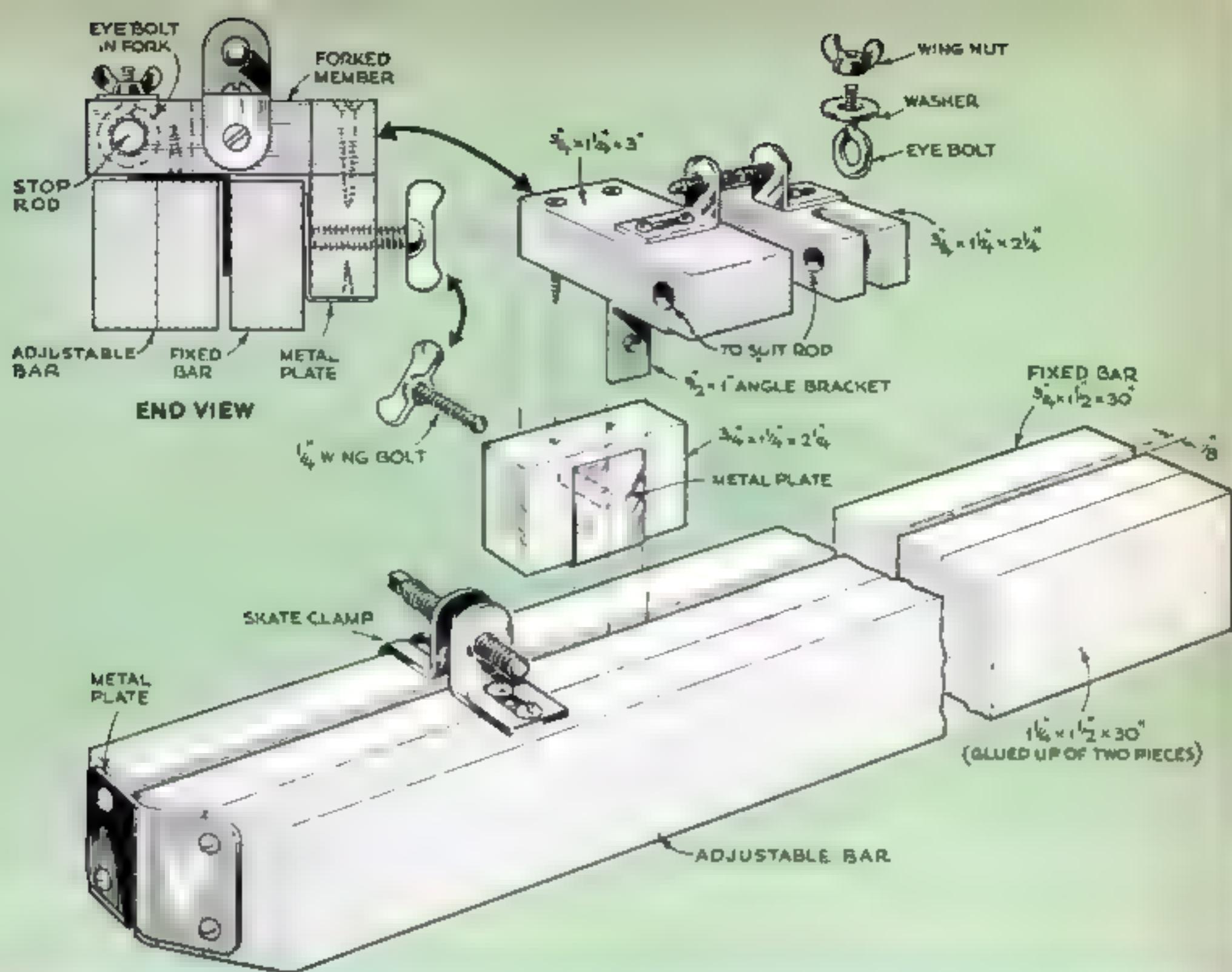
Cut a $\frac{1}{8}$ "-thick wooden bar to fasten

to the miter-gauge head with bolts or screws. Make the movable bar by ripping two $\frac{1}{8}$ "-by- $1\frac{1}{2}$ " pieces from the same stock, turning one end-for-end to reverse the grain, and gluing them together that way. Any warp in the members of this laminated bar will cancel itself out.

Hinge the movable bar to the fixed one with a thin metal plate screwed on across the ends with a gap between the



TAPERS ARE RIPPED to close accuracy in this jig. Width of the piece cut is determined by the position of the rip fence. A little stop block (arrow) forces the work into the blade as the taper jig is slid along the fence.



bars. Straighten one bracket of a skate clamp, cut it a trifle short, and screw the clamp across both bars.

For the stop-rod carrier, glue and screw two hardwood blocks together at right angles. Attach a corner bracket to one so that the assembly will straddle the fixed miter-gauge bar. Drill the block that goes behind the bar with a No. 7 drill and turn in a $\frac{1}{4}$ " wing screw to cut

its own threads in the wood. Screw on a thin metal plate to cover the hole and protect the bar from the bolt when it is tightened to lock the carrier.

Bore the horizontal member and the forked end of a third piece to a sliding fit for the stop rod. This is clamped by an eyebolt set into the fork. A skate clamp with the skewed ends hammered square is fastened across the two parts.

Tapering Jig Can Be Set to Precise Angles

ROUGH adjustment of this tapering jig is made by locking the spreader bar with a wing nut sliding in a slot. Then it is set to hairline accuracy by turning a skate-clamp vernier on the spreader.

To prevent warping, make both the long bars of $\frac{3}{4}$ " plywood. Cut the 8"-long slot in one just wide enough to let the

square neck of the bolt slide but not turn in it. Recess the underside to sink the bolt head flush beneath. Join the two bars with a short, wide-leaved hinge or a small hinge hasp cut short.

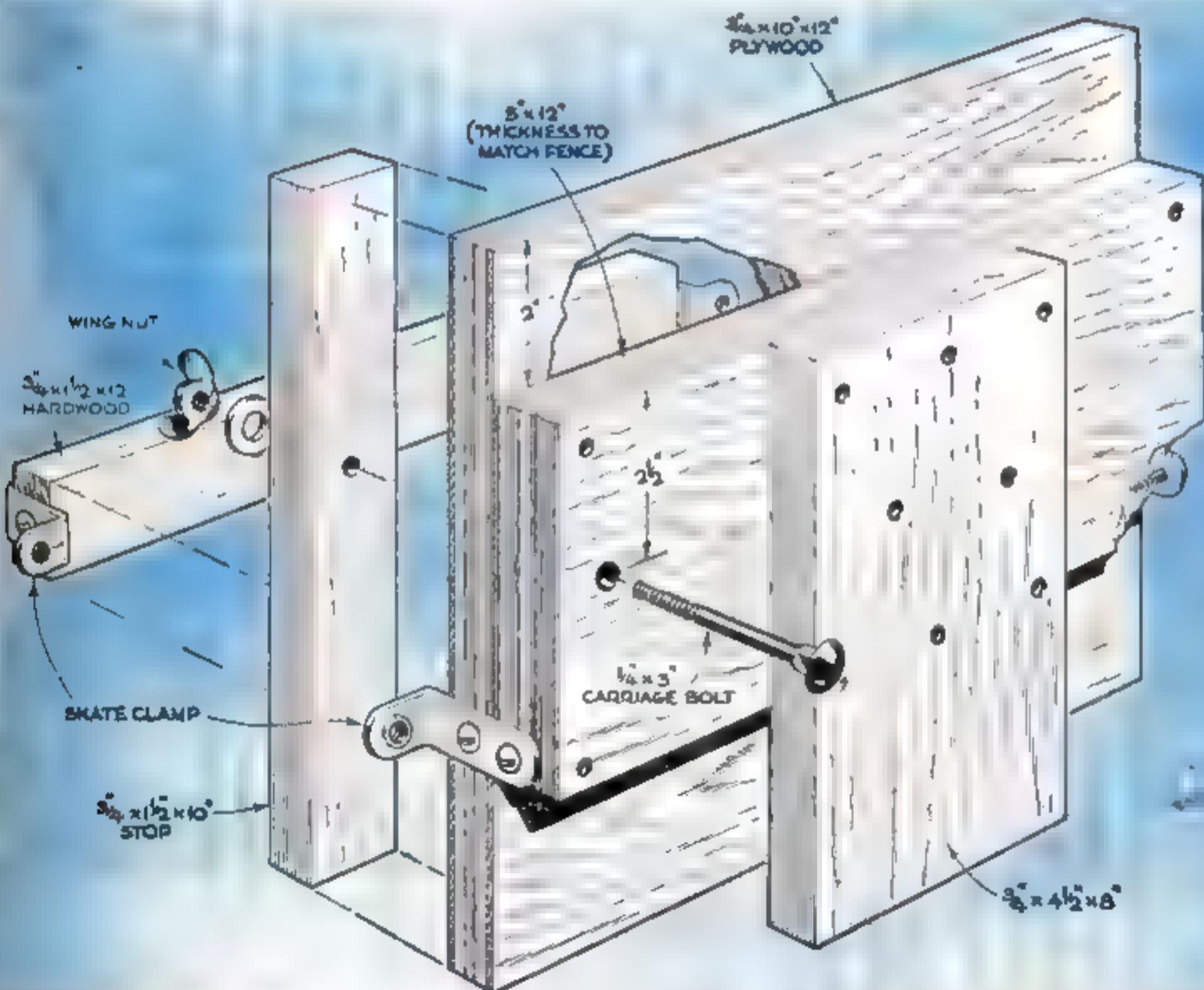
Use hardwood for the spreader bar, making the tongue joint a close sliding fit. Mount the skate-clamp brackets on

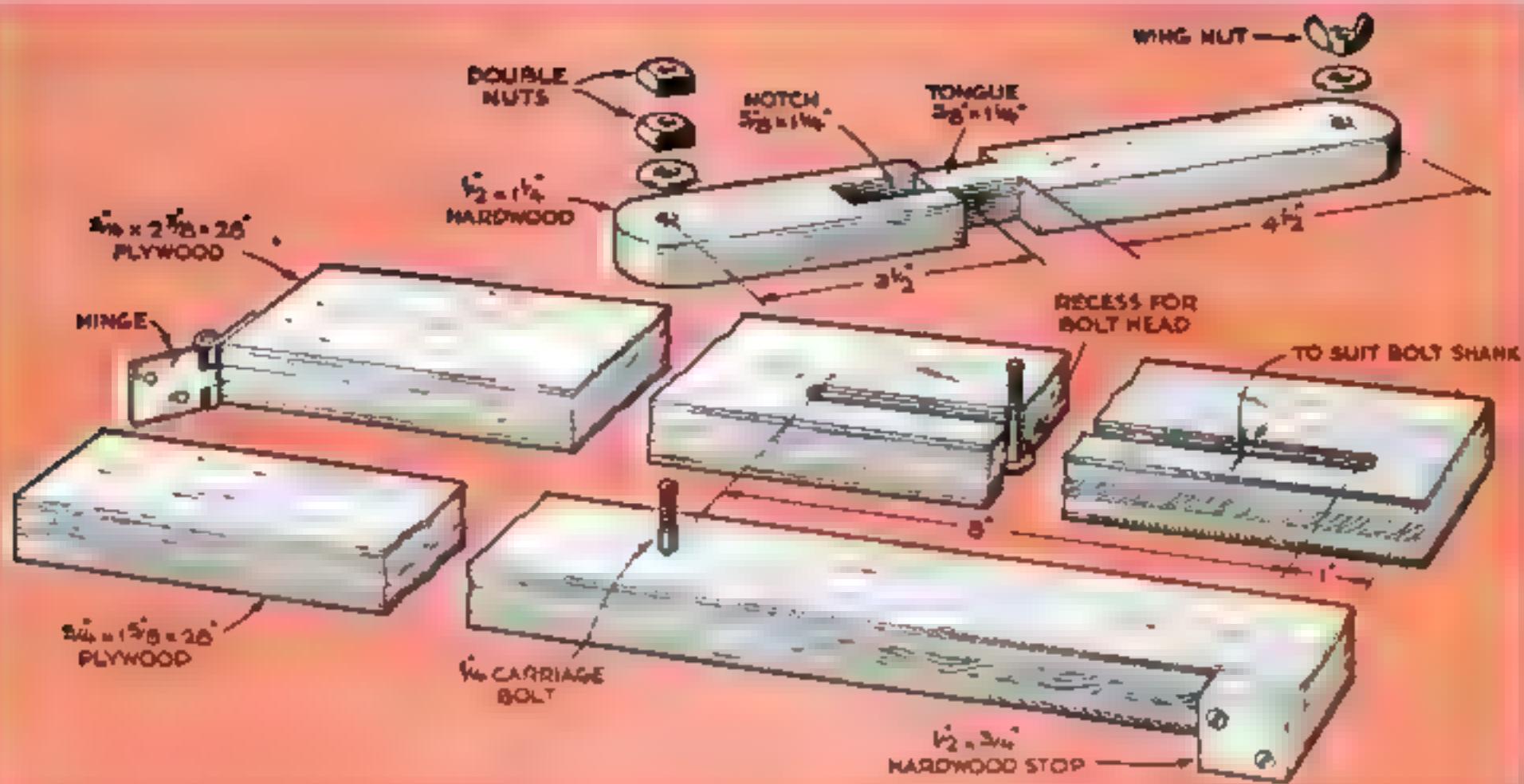
the tongue and behind the notch as shown in the photo at right. Draw a nut up on the pivot bolt just tight enough to still leave the bar free to swing on it. Then lock this nut by tightening a second nut down against it, while holding the first.

Draw two pencil lines on the slotted bar, 12" and 18" from the hinge end, for measuring taper. Fasten a small stop block with wood screws to the end of the other bar to butt work against.



A SKATE CLAMP BRIDGES the tongued joint in the spreader bar as shown above. When plans specify taper in inches per foot, set a square against the slotted bar at the 12" or 18" mark and measure the taper setting called for between the bars.





Skate Clamps Hold Stock in This Tenoning Jig

IT TAKES only a moment to place this jig on the circular saw, but with it you can cut end tenons, half-laps, and grooves for miter splines both safely and accurately. A wide range of work thickness can be held in it by two skate clamps.

Cut the upright to size, and horizontally across its back glue and nail a second piece. Make this of one or more thicknesses to exactly equal that of the rip fence. Then fasten a vertical member

to this to ride the other side of the fence, with paper shims between if necessary to get sliding clearance without slack. (It's wise to make a trial assembly with clamps before gluing.)

Mount a vertical stop strip with a single pivot bolt running through the upright and horizontal piece. Mount a clamp bar with two skate clamps, one at each end, far enough below the stop pivot to let the stop swing past 45° freely.

RIPPING TENONS is safe and easy to do accurately with this jig. Set it astride the fence, clamp the work in against the vertical stop, and adjust the fence to locate the cut.

SLOTTING A MITER for a slip tongue becomes simple with dado cutters on the saw arbor and this jig to hold the work. Lock the vertical stop at 45° and clamp work against it. —END



a board across the top of the opening, then if this does the trick, make a metal baffle. This can be a large angle iron bolted under the top lip or a strip of brass or copper bent to fit the opening.

Ready-made metal hoods are also available that extend the fireplace lip both forward as well as down. These help scoop in the air if the fireplace is shallow, making it necessary to build the fire near the front.

5. Is it leaking?

Tiny cracks in old masonry make a chimney as hard to draw through as smoke through a punctured cigarette.

You can test for leaks by getting a good smoky fire going (pieces of tarpaper or green wood) and covering the top of the chimney with an old, wet blanket. Watch for telltale puffs around the outside walls of the chimney and mark the spots. Chip out the old mortar at least 1" deep, wet it down, then pack in new mortar to fill up the leak.

If you suspect that there are leaks, but can't track them down or reach them, it's wise to call in a chimney repairman. Sizable cracks—whether they affect draft or not—can become a fire hazard and should be sealed up.

Your chimney may also be "leaking" if the fireplace flue is shared by a furnace, stove or other flue. Two smoke-makers using the same flue can cut your draft in half. This arrangement is no longer legal in most areas, but may be found in older homes.

Shut off extra flues by closing their dampers when the fireplace is in use and installing dampers on those that don't already have them. Any old flues

that are no longer being used should be sealed up permanently.

6. Deflecting downdrafts. If cold air pours down your chimney, you'll have a hard time getting a good draft to go up. Check your chimney by holding a wet finger up into the throat.

Make sure that your flue tiles project several inches above the chimney top. If they don't add an extra tile on top and

slope the cement up around it so that gusts of wind will be deflected upward

If your chimney doesn't extend high enough above your roof, cold air may be spilling down the slope right into the flue. Minimum height requirements in most areas are at least 2' above the highest part of a peak roof and 3' above a flat roof. If your chimney doesn't measure up to these, it may be necessary to have it extended—which is as important for fire safety as it is

to securing a proper draft.

Sometimes a nearby hill, a higher building or tall trees will deflect wind down even a properly built chimney. You can correct this by mounting a deflector plate over the top of the chimney with a piece of slate or a thin cast-concrete slab. Build up four piers of brick about 5" to 6" high at the corners of the chimney to support the slab. You can also buy several kinds of metal hoods designed to stop downdrafts.

If your chimney has a spark-arresting screen on top, be sure that it is at least twice as big as the flue opening and is mounted above it, not down inside it. A small, soot-clogged screen can really give your fireplace a good case of the wheezes.—David X. Manners.



CHIMNEY TOPPERS like these help solve special smoke problems. The A-branch at lower left puts a strong downdraft to work by funneling it through arms to create suction that increases up-draft. The turbine type at the right spins with the wind to help draw the smoke upward. The small "shanty" stack at the upper left, though mainly a rain shield, also deflects downdrafts.



New "Convertible" 20-watt Amplifier and Pre-Amp with controls, in one versatile unit, only \$99.95

THE new G-E Convertible is a dual-chassis design. In a single, amazingly flexible and low cost unit there's a powerful amplifier, with 20 watts of undistorted output—plus a pre-amp with seven panel-mounted controls. It gives you sound as it was meant to be heard. There's New Installation Flexibility, too! With General Electric's dual-chassis design, the amplifier and pre-amp may be mounted inde-

pendently in built-in systems. Or, as one complete unit, the handsome Convertible may be placed on a bookshelf or table.

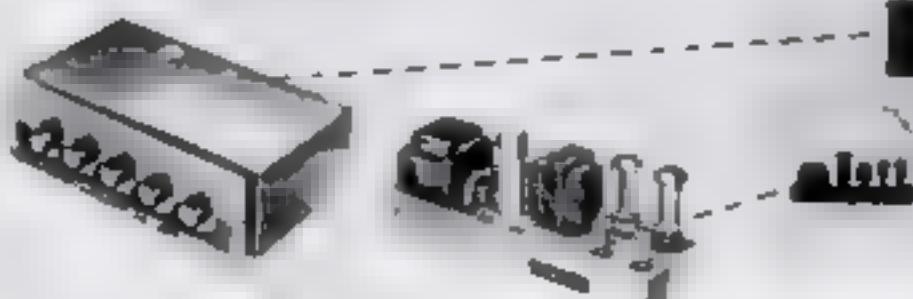
Write today for new hi-fi ideas and the name of your dealer. He can show you the full line of General Electric Hi-Fi components. *General Electric Company, Special Products Department, Section R61106, Electronics Park, Syracuse, New York.*

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and that it made driving pretty rough

Accordingly, he drove Pete's car out to a hill that was similar and started down it, putting the car against compression. He was halfway down when it suddenly jumped out of gear. The sudden release of the holding power of compression caused the car to shoot away like a rocket. Gus slammed on the brakes and managed to come to a shrieking halt that caused the chickens to cackle loudly in protest.

"There," Pete crowed. "You see, it does slip out of gear."

"Probably," Ezra said sourly, "pulled out of line by that foxtail waving in the breeze."

"I didn't put that thing up there," Pete protested, "and I wouldn't have left it up there if you fellows hadn't got your wind up over it so much."

"You didn't put it up there?" Gus queried.

"No," Blinstock said. "Tony Triesta hung it there—you know Tony, Gus."

GUS did know Tony, a lad who lived down the road from Pete a couple of miles, who had a shine on a girl over in Stanfield, and a great yen to become a mechanic like Gus.

"How," Gus queried, "did Tony happen to do that?"

"Well," Pete said, sort of shamefaced at being caught in a kindly deed, "you see, Tony hasn't a car of his own and he was in a lather to take that girl friend of his out in Stanfield. So I let him use my car over a weekend. He tied the foxtail on the thing. He's a nice boy, Gus, and proud. He didn't want to be beholden to me for the use of the car, so he paid me back by putting in a new clutch plate."

"He put in a new clutch plate!" Gus breathed. "I see."

Gus did see. Tony, in his zeal to become a mechanic, had rigged up a workshop in his father's machine shed, where he tinkered on his friends' cars, and worked on the farm machinery.

"Maybe," Gus said thoughtfully, "we'd better have a look at your transmission. Let's go back to the garage . . ."

WHEN Gus pulled the four studs that held the transmission to the bell housing, slid the transmission back and shone a light on the two milled faces, he found a small bit of gravel, crushed by the pressure when the stud had been tightened. He cleaned the milled faces and bolted the transmission tight against the bell housing.

"That shop of Tony's—" he asked Pete, "it has a gravel floor, doesn't it?"

Pete nodded.

"Well," said Gus, "when Tony put in your new clutch plate he picked up a bit of gravel—just enough to tip the transmission over out of line with the clutch. That threw the car out of gear when going downhill against compression."

"But it's all fixed now, eh, Gus?" Pete wanted to know.

"No," Gus said flatly, "it's not. It won't jump out of gear any more, but you have no business, Pete, running around with such poor brakes, and you know it."

"You might as well talk to a post, Gus," Ezra Hendricks cackled. "Pete's so tight that he wouldn't dig up the money for a brake job unless you hog-tied him and pried it out of him with a crowbar."

"Is that so!" Pete shoved his nose practically into Ezra's bushy whiskers. "Well, I'll show you a thing or two. Gus, put on the best brake lining you've got. Ezra Hendricks, get your whiskers out of my face or I'll . . ."

Gus winked broadly at Stan Hicks as he prepared to do the brake job. The three old codgers watched him for a few minutes, and then went down to the drugstore together for an ice cream soda.

"Human nature," Stan Hicks remarked, "is sure peculiar."

"Isn't it, though?" Gus chuckled as he pulled a rear wheel.

END

NEXT MONTH: Gus joins the rescue squad.

MAGNA unveils revolutionary new line of power tools



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Magna Power Tool Corporation, manufacturer of SHOPSIMITH®, the original multi-purpose home workshop in one unit, is now introducing a new line of MAGNA single-purpose power tools.

MAGNA-LINE includes the revolutionary new Magna 9-in. Saw with "The Helping Hand"—a built-in extension which makes the largest effective table on the market;

4-in. Jointer with the longest table, largest fence in its class; 11-in. Bandsaw with automatic blade tracking; 6-in. Belt Sander with automatic belt tensioning; 18-in. Jigsaw with full speed-range; and Compressor-Sprayer with 100-ft. range.

For specifications and full information on the new MAGNA-LINE single purpose power tools, mail the coupon on Page 236.

NEW Magna-Line **NEW** Magna-Line **NEW** Magna-Line



Magna 9-in. Saw with "The Helping Hand"

The new Magna 9-in. Saw is the only tilt arbor saw with "The Helping Hand"—a built-in extension which makes the largest (34" x 24") effective table on the market, allowing bigger rip and cross-cut capacity than any other saw; Epicyclic Speed-gear Control gives you full 45° tilt with only 10 turns of knob, compared with 40 to 60 turns on other saws; Single-Knob Control—push

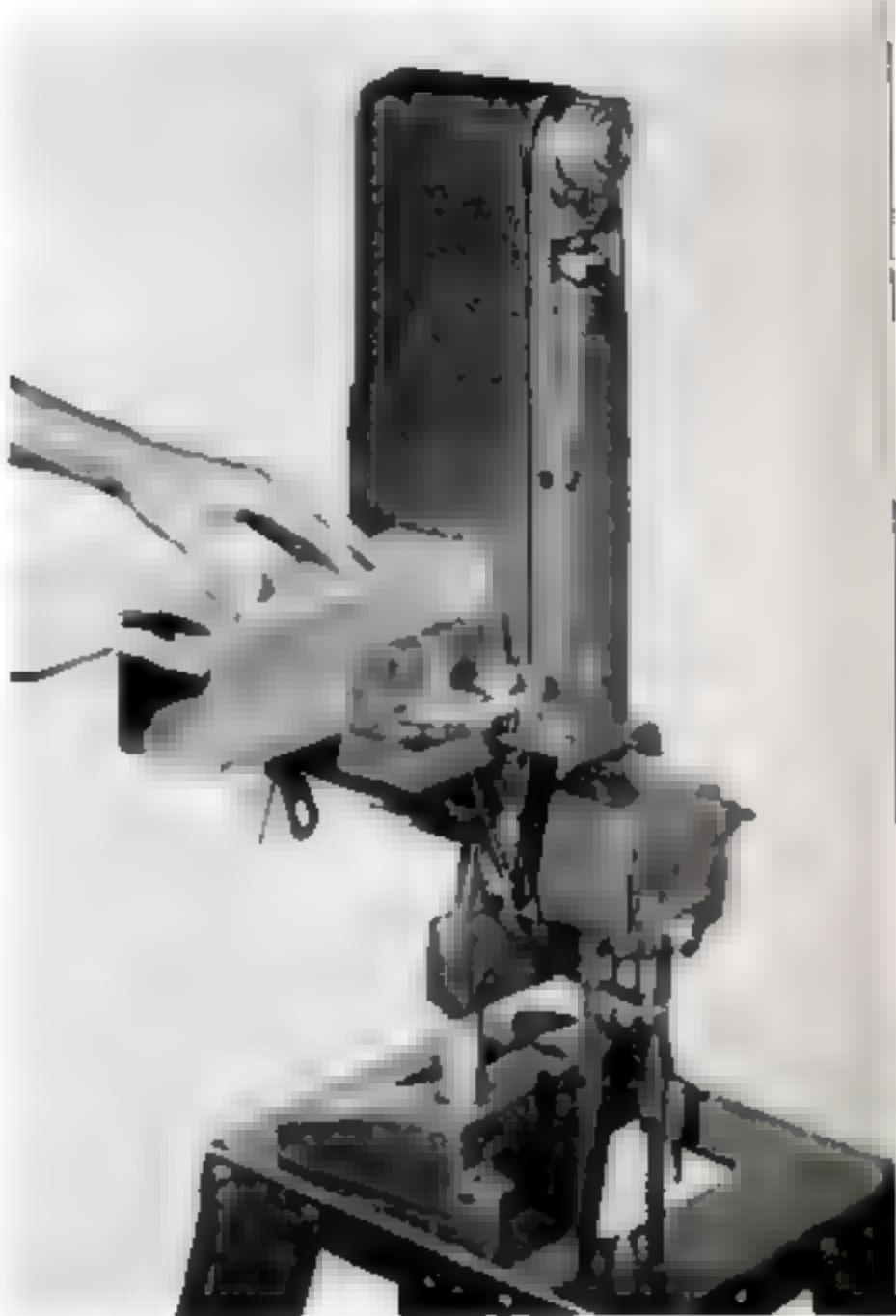
for projection, pull for tilt adjustment; Self-aligning Fence locks front and back with single knob; colored Safety Zone Table Insert cannot catch work piece; exclusive pressure-cast tub front bolted rigidly to table, coordinates all controls; externally adjustable Tilt Stops; constant tensioning of matched twin belts; 3 Auto-Stops on Miter Gauge.

NEW Magna-Line **NEW** Magna-Line **NEW** Magna-Line



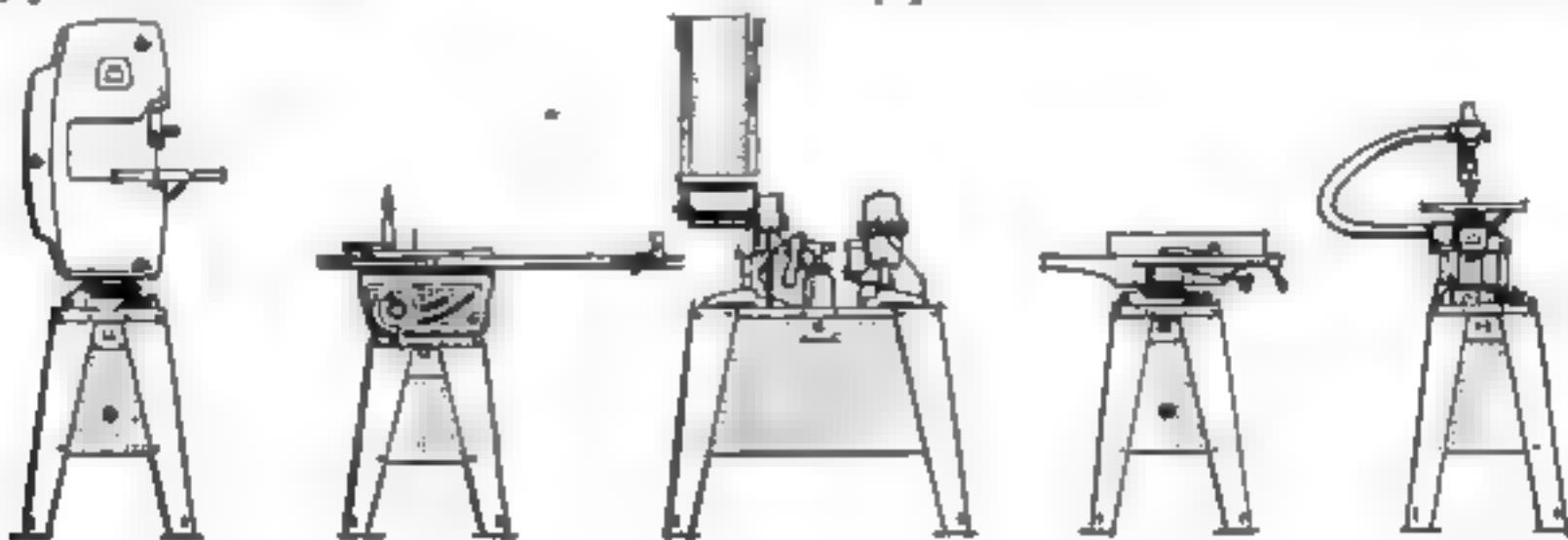
MAGNA 11-IN. BANDSAW WITH AUTOMATIC BLADE TRACKING

A new engineering triumph offering: exclusive Automatic Blade Tracking—greater safety, easy to change blades; Single-knob Blade Guide Control; cross-cuts any length stock (up to 6" width) without throat interference; sealed ball bearings; maximum safety—everything enclosed except essential cutting portion of blade.

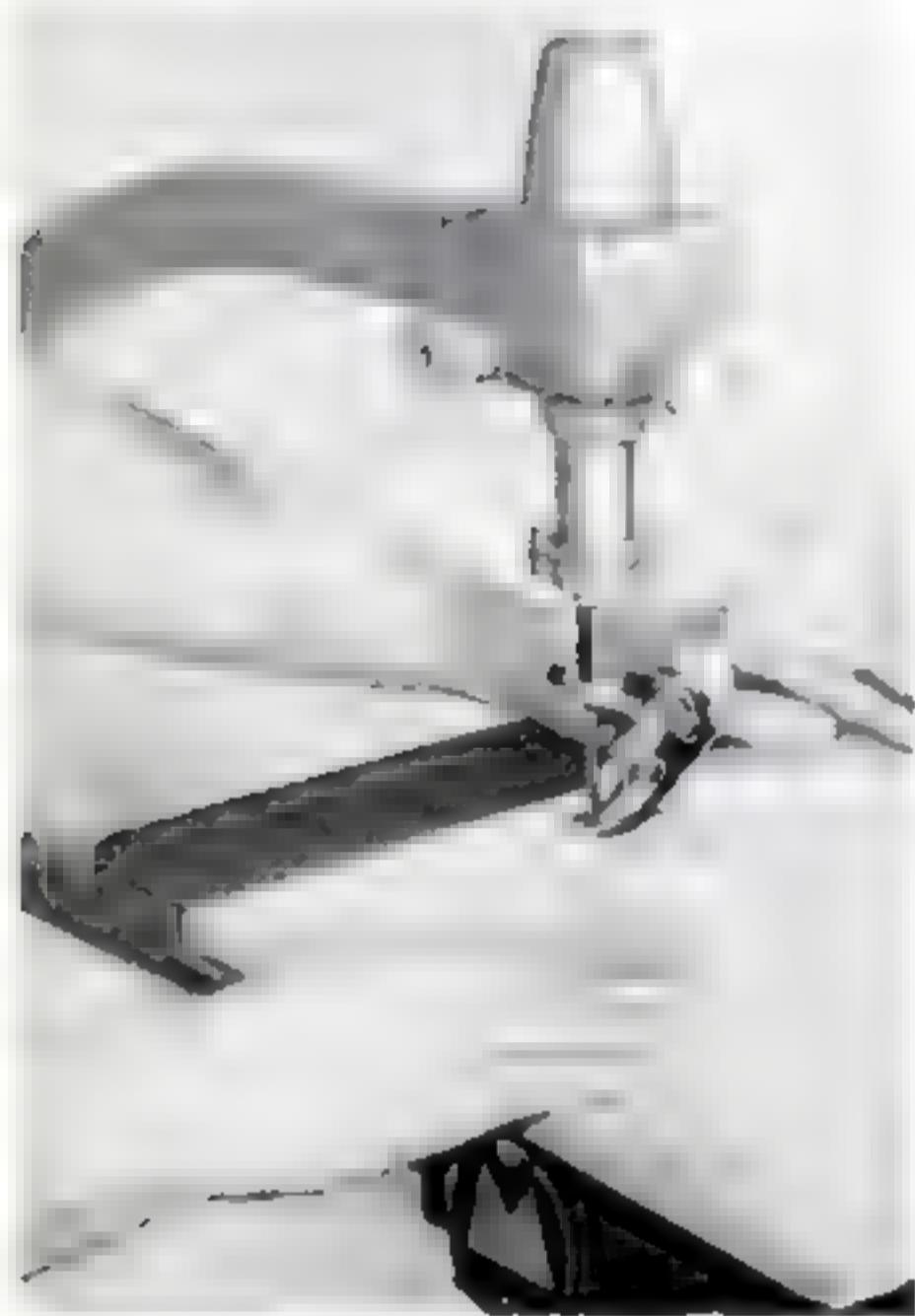


MAGNA 6-IN. BELT SANDER WITH AUTOMATIC BELT TENSIONING

Compare these big features with those of any other belt sander: Single-knob Control gives Automatic Belt Tensioning; instant belt removal; 6-inch by 16½-inch Back-up Plate for large work in horizontal or vertical position; table tilts in either direction, mounts as fence on either side; tilts, locks in any position from horizontal to vertical.



NEW Magna-Line NEW Magna-Line NEW Magna-Line



MAGNA 18-IN. JIGSAW WITH FULL SPEED-RANGE

The Magna Jigsaw gives you precision, capacity, ease of adjustment. Exclusive Full Speed-range operates as fast as 2500 rpm! Cuts through 2-inch stock at low speeds, smooth-cuts thinnest wood at high speeds. Use it for metal working, also, or as regular saw for straight cuts with heavy blades. Blower keeps cutting-line sawdust free.



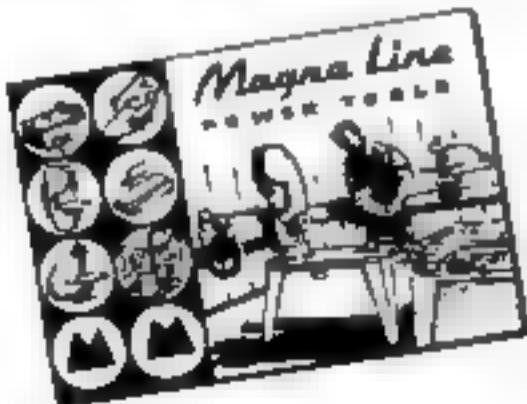
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What Grade of Gas Does Your Car Need?

[Continued from page 136]

have to buy a fuel that they don't need?

Sun's market experts state that they can give drivers a choice of fuels more cheaply with their new pump than by installing extra pumps, since with this system they need tank trucks for only two kinds of fuel—regular and concentrate.

Today—1960's fuel. Meanwhile, the Esso Standard Oil Company has installed a third pump at its stations to vend a new 100-plus octane fuel called "Golden Esso Extra" in the six city areas of Baltimore, Boston, Memphis, New Orleans, New York and Washington. Esso plans to unveil the pumps in most of its 18-state territory by the end of the year. Esso originally designed this new fuel for 1960 cars, but advanced the date because their tests indicated that while 95 percent of the cars now rolling will do well on regular or premium fuel, one out of five needs an added lift.

As a result of the Sun and Esso jump to upper octanes, conference-room ashtrays are overflowing throughout the industry. Spies from rival firms, armed with binoculars and tally charts, are parked near Sunoco's Orlando pumps, finding out what cars take what fuel. The Humble Oil and Refining Company, Esso's corporate cousin, is planning 100-plus pumps for the rolling palaces of Texas tycoons.

Other firms point out that the move may make sense for Sun and Esso, which operate mostly in the East where octane numbers run higher than the national average, but the decision is tougher for firms that blanket the country.

The octane bandwagon. At press time Continental had begun test marketing a third grade of fuel and Sinclair was reported about to follow. Texas was debating whether to boost octane rating of its premium or use a third pump. Shell had already announced a "white pump" to dispense its own super-fuel. And Socony said, "No comment—yet." Judging by the tones of all voices, one might guess that it's only a matter of time before the whole industry joins the parade. **END**

Care and Feeding of Engines

BY
S. P. CORP

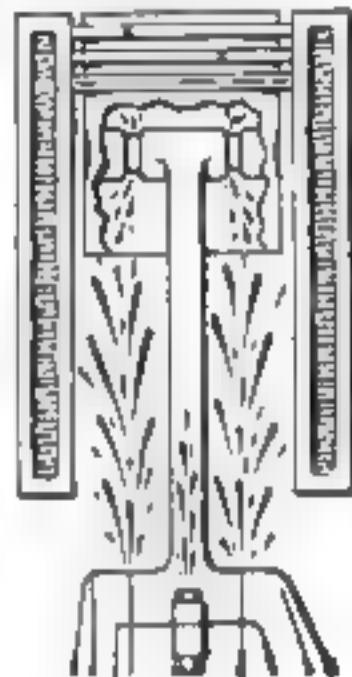


BREAKING IN AN ENGINE

Correct engine loading and good lubrication are important in breaking in a new or reconditioned engine. Low-speed idling may cause scuffing of rings. Idle speed of 25 to 30 miles per hour insures lubrication of rings, cylinder wall, pistons, and valve parts.

Short periods of loading are desirable. When engine is warmed up, drive at 25 m.p.h., then push down on accelerator until car speed is 50 m.p.h. Now release accelerator, letting car coast back to 25 m.p.h. Repeat several times. Consult your car manual for break-in schedule recommended by the manufacturer. Caution: Never accelerate a new or reconditioned engine from low (5 to 10 m.p.h.) speed with a wide-open throttle. This would cause overload without proper lubrication.

Drive for the first 200 miles at normal speeds up to 50 m.p.h. Avoid sustained high speeds. If traffic forces you to drive under 25, shift into low gear to maintain engine speed.



12-VOLT BATTERY CAUTION

In the familiar 6-volt battery, the anti-freeze value of the electrolyte will protect the battery even when there is not enough power to start the engine. In a 12-volt system, with its higher voltage and lower amperage, the battery will not stop cranking the engine until it is completely run down. In this condition the specific gravity will be so

near to pure water that it will freeze just below 32° F. system. The battery will not stop cranking the engine until it is completely run down. In this condition the specific gravity will be so near to pure water that it will freeze just below 32° F.

Never allow a 12-volt battery to stand in a discharged condition in cold weather. Freezing will cause irreparable damage.

ASK FOR FREE HANDBOOK



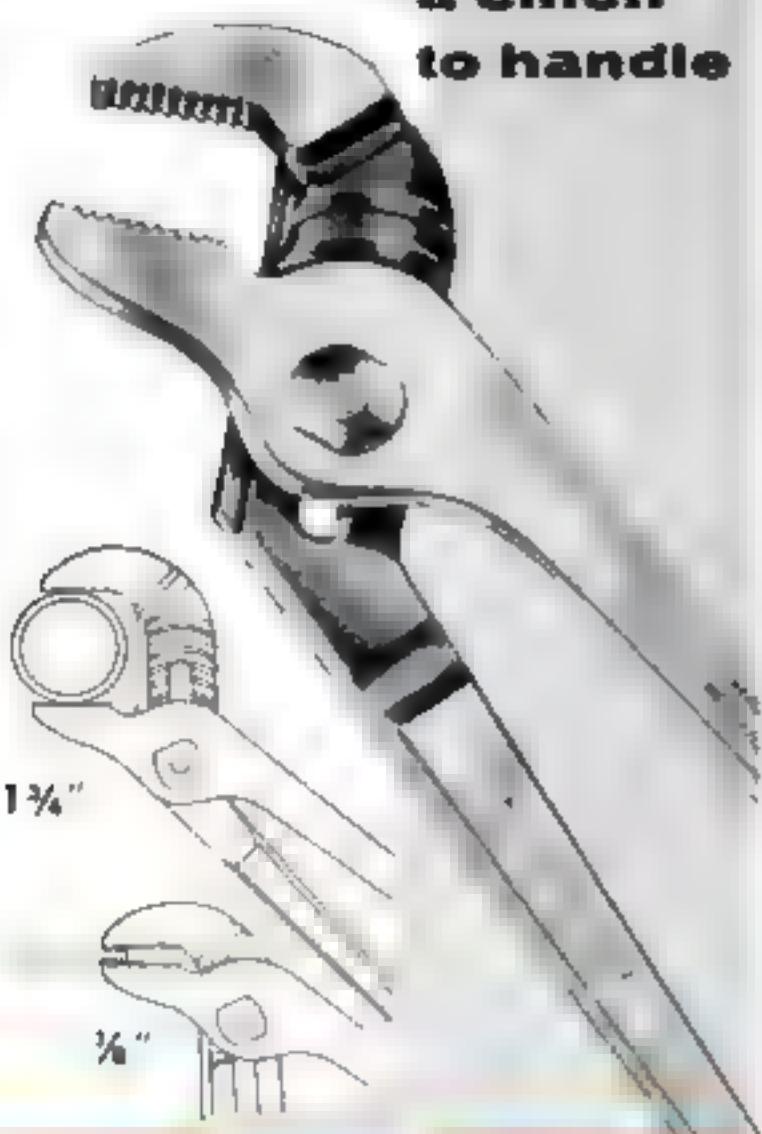
"Care and Feeding of Engines" is an illustrated manual of engine care prepared to help you save money on car repairs. Your copy will be mailed on request. When you re-ring, be sure to use **SEALED POWER KromeX Ring Sets** for quick sealing, immediate oil control, and long, long wear. Your dealer has them or can get them for you. Sealed Power, Dept. H-10, Muskegon, Mich.

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grips like a pipe wrench

**a cinch
to handle**



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Terrific gripping power on any shape $1/8$ " to $1\frac{1}{4}$ " size. Long and streamlined . . . easy to use in hard-to-get-at places! Some of the reasons why Channellock is the favorite plier of craftsmen everywhere. And Channellock will be your favorite, too . . . for the same reasons. No other plier does so many jobs so well. Ask your hardware man for a Channellock No. 420.

RESEMBLES A GENUINE CHANNELLOCK



CHAMPION DEARMONT TOOL CO. MEADVILLE, PA.

Dot-and-Dash Doctors Save Lives at Sea

[Continued from page 148]

ments of shark bite, contact with Portuguese men-of-war, and stings of poisonous insects are not uncommon.

There are touching cases in which a captain, wrestling with unfamiliar terminology and frightening symptoms, tries to translate what he sees into words he knows: "Patient complains of grinding pain in lower starboard quadrant."

Many badly infected wounds have been sterilized via radio. Scalps have been sutured and broken limbs have been set. The DHMEDICO doctors have treated peptic ulcer; they have air-dropped drugs; they have prescribed for a toddler who accidentally swallowed an enormous overdose of seasickness pills. They have, across thousands of miles, probed for bullets.

They have experienced a deep sense of frustration when the captain of a foreign ship, groping for words, informed them: "I have been bereft of the petitioner."

The radio operators and doctors can take all this in their stride. But there is one emergency that again and again is unsettling. It can best be summed up in the message received from the captain of a South American ship 300 miles southeast of Cape Hatteras:

PATIENT SHE YOUNG BEAUTIFUL WOMAN. BABY COMING TOO SOON. PATIENT SHE FEEL AWFUL.

The DHMEDICO doctors flashed a concise course in fundamental obstetrics across the ocean, hundreds of words of it, ending with:

CLEANLINESS IS OF THE UTMOST IMPORTANCE. COD BE WITH YOU.

Then, from Amagansett to Manhattan to Staten Island, everybody paced the floor mentally. Hours later, the tension was broken:

BOY HE EIGHT POUNDS. MOTHER SHE FEELS VERY VERY WONDERFUL.

Which made everybody connected with this DHMEDICO case feel very very wonderful.

END

Texaco Tips On Car Care

How to test your brakes

Be sure that all tires have equal and correct pressure, then drive to a hard-surfaced road where there is no traffic. Then, at twenty miles per hour speed, hit the brakes fast and hard. If your car doesn't stop within twenty feet, or it pulls to one side, or only one tire makes a scuff mark, your brakes need expert attention. If you have to pump the brake pedal, probably the hydraulic fluid level is low, or air is in the system. For safety's sake, don't delay any brake work found necessary.



How to enjoy "cushiony" motoring



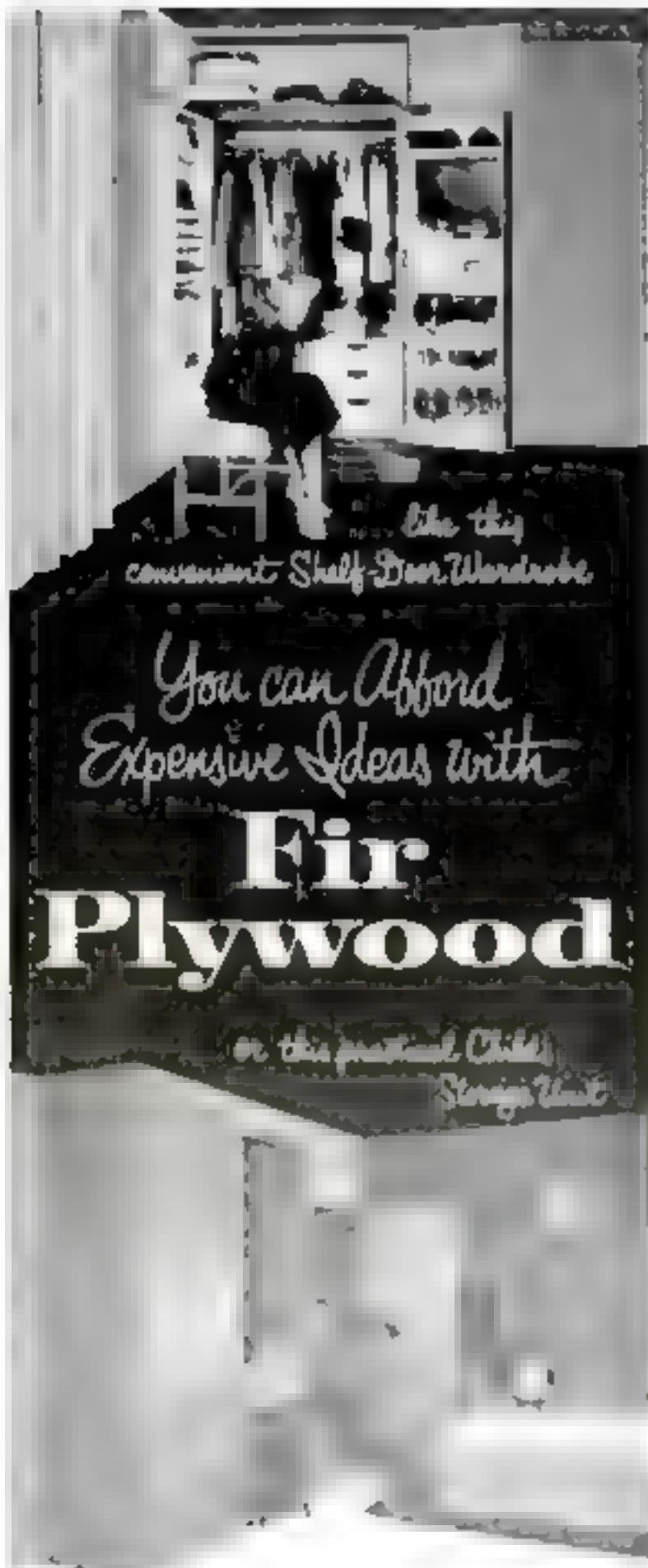
Treat yourself—and your car—to Marfak chassis lubrication. Tiger-tough Marfak protects vital chassis points of wear and friction . . . won't jar out, shake out or splash out . . . keeps giving you that cushiony feeling for 1,000 miles or more. Today, drive in for longer lasting Marfak chassis lubrication. Available from your Texaco Dealer, the best friend your car has ever had.



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Douglas Fir Plywood
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Trademarked for your protection, fir plywood comes in standard grades as well as special textured or overlaid panels. DFPA industry trademarks attest quality, performance, value.



Plans Available from your lumber dealer
or write (U.S.A. Only) Douglas Fir Plywood Association, Tacoma 2,
Wash., Sept. 11. Please order plans by name, section 10c for each.

How Army Tests Pick Good Drivers

[Continued from page 164]

7. "I get a kick, too, frankly, out of driving pretty close to some slowpoke to scare him because he's a menace."

8. "I like people to tell me that I'm different."

There are some jokers among these that you don't know how the Army wants you to answer. Not even the Army psychologists themselves knew what answers they wanted until they began to

A considerate traffic cop is one who will listen to your story from beginning to end before starting to write out your ticket.

—THE SIDEWALK SUPERINTENDENT

find out what kind of drivers said what. In general if you said "true" to 1, 2 and 6 you're like a lot of drivers who come up with safe driving records.

As for *liking cops*, the Army naturally knows that some cops are likable and some aren't. But the guy who dislikes *all* cops may have a reason that has something to do with his driving.

That "straight exhaust pipe" question is a sleeper. Have you also maintained a dual carb, or had any experience with narrow-tread, high-pressure tires? Hal! There's a little hot-rodding in your past.

That may be bad, but it also may be good, depending on how you answer some of the other questions. If your hot-rodding background is coupled with a "true" answer to "I like to make people mad"—well, look out. But if you say "true" to "I usually test my brakes after driving through water," you're a pretty good bet.

Now about that question on religion. No one claims that this is an open-and-shut matter, but the experts are finding that people with strong religious convictions tend to "conform" more than other drivers. And if there's any single thing that keeps drivers safe on today's roads, they say, it is *conforming* to the flow of other cars in traffic. It's the fellow whose driving is "different" that the Army tests tend to weed out. END



3 Seconds — Disintegration of a Paper Clip

You're looking head-on into the combustion chamber of the world's most powerful torch. An ordinary paper clip is literally being disintegrated by the terrific heat of its blast furnace blaze. The sparks are burning particles of tin which a split second ago coated the parent metal of the clip. Now they are ashes. Note the high yellow color of the steel. It is practically in the molten state. This photo was snapped 3 seconds after the paper clip was placed in the sizzling hot flame of the new Prepo Six 40 Super Duty Torch.

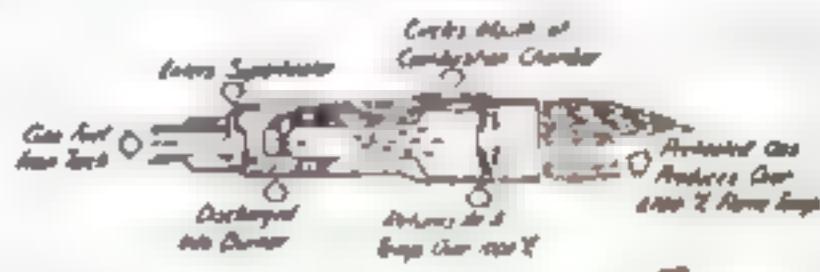
Miracles Can Be Made—Miracles can happen but the miracle of performance of this new torch didn't just happen. It was created by the nation's top experts in combustion engineering to produce a completely new standard of torch performance. You have never seen or owned a torch that can match the capacity of this one, its temperature, its speed at work, its performance on the job. By today's highest standards the work achievements of this new torch are indeed miracles.

Preheated Gas Is Secret—Hand torches operate on liquefied gas fuel delivered to you in disposable tanks.

In torches of conventional design the discharge of fuel is from the tank along a direct line into the burner. In route the fuel expands to 220 times its compressed volume in the tank. Refrigeration of the expanding gas occurs, producing a continuous cooling effect on the combustion taking place in the burner.

A completely different principle is employed for the first time in this new type torch. Before entering the combustion chamber of the burner the gas is diverted through a super-heater tube

to and around the hot mouth of the combustion chamber. Here the gas is preheated to a temperature of over 1000°F like this:



When discharged into the burner, this preheated gas produces a flame temperature 900°F hotter than can be obtained with conventional torches. Flame temperature exceeds 2700°F, highest of any hand torch made. Burner output is 7000 BTU per hour, the greatest volume of heat of any hand torch made. This new torch will perform any work short of welding.

Wide Range of Work Possible—For all of its remarkable power, at the touch of a finger this new torch can be "throttled-down" from its disintegrating blast to a soft whisper of flame. Perfect control of flame variations is at the instant command of the operator.

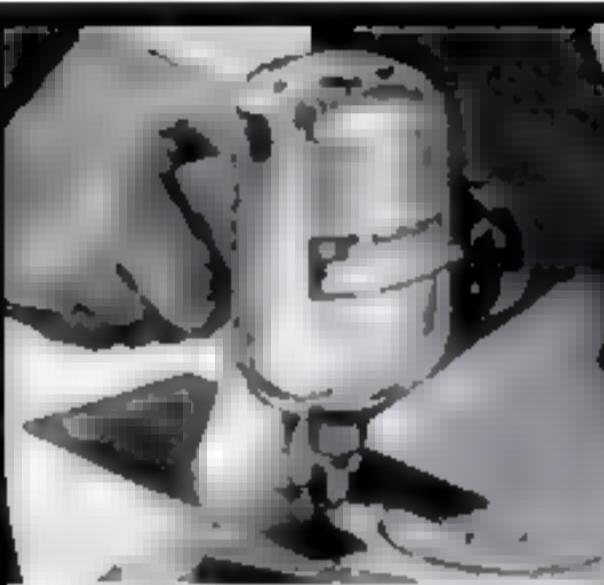
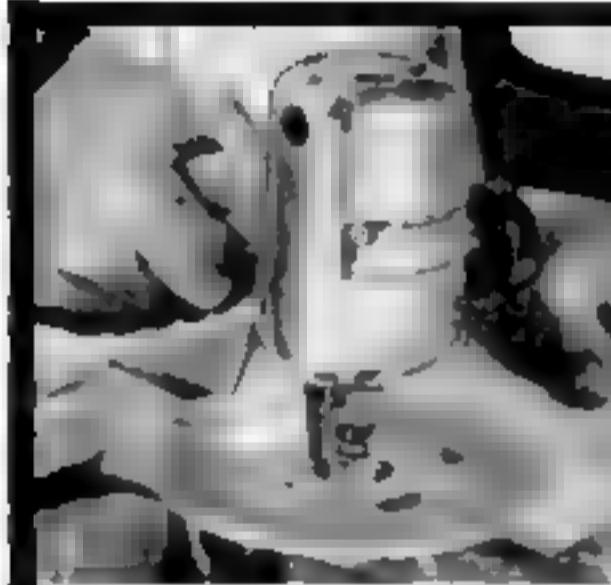
Unusual Performance Guarantee—The new Prepo Six 40 Super Duty Torch is guaranteed by the makers to outperform any torch you have ever seen or owned. Try one for as long as you like. If it fails to meet your most demanding expectations, just return it for full refund. The price, complete with fuel tank, is \$6.95. Replacement Prepo fuel tanks are 69c. If no Prepo dealer is available in your neighborhood then order direct. Add 25c for postage.

PREPO CORPORATION Edgerton, Wisconsin

NOW— 6 great new power tools in 1

Porter-Cable's revolutionary

ROUTO-JIG!



1 ROUTER! Routo-Jig converts to a high-speed, efficient portable router in seconds! Special bits available for fast, easy work in wood, plastics, compositions. 24,000 R.P.M. speed for clean, smooth, finished cuts in every application.

Model 140-R Router \$42.50

2 JIG SAW! Routo Jig is a new kind of portable jig saw with rotary action—for intricate contours or straight cut-off work in wood up to 1" thick. Sturdy cutting bit reduces blade breakage to a minimum.

Model 140 Jig Saw Router \$49.95

3 SHAPER! Husky accessory Shaper Table makes Routo-Jig a precision Shaper and Joiner. Quick, accurate, professional results on difficult rabbet cuts, moulding cuts, joiner work. Adjustable fence, built-in safety guard.

Shaper Table \$12.00

Never before—a single tool so versatile! The amazing new Routo-Jig converts in a jiffy to any one of six top-quality portable power tools—lets you equip your workshop at a fraction of former costs!

Use the Routo-Jig as a *router*, for mortising, grooving, rabbetting...as a *jig-saw*, for cutting intricate contours and freehand shapes...as a *high-speed finishing sander*, with orbital motion that can't gouge or mar.

With its own accessory table, the Routo-Jig is a precision *shaper*—for moulding, beading, joining. It's a smooth-cutting *power-plane*—lightning-fast on the toughest planing jobs. And the Routo-Jig even goes to work in the garden—as a light, handy lawn trimmer for the places that mowers miss!

It's a shop in itself! And, like every Porter-Cable tool, the Routo-Jig is *quality built throughout*—for years of dependable, trouble-free service. See it—try it—at your Porter-Cable dealer's today! Or write for free literature.



4 **POWER PLANE!** Routo-Jig converts quickly into a precision power plane. 24,000 cuts per minute for velvet-smooth surfacing—instant bevel and depth adjustments. Special design prevents digging in or gouging. Plane Attachment.....\$12.90

5 **SANDER!** Precision-built sander attachment makes Routo-Jig a fast, efficient finishing sander. Orbital motion sands with, against, or across the grain—high speed and generous sanding surface make finishing quick and easy. Sander Attachment.....\$19.95

6 **GRASS TRIMMER!** With accessory trimmer unit and long, stand-up handle, Routo-Jig takes the work out of grass trimming—around sidewalks, driveways, flower beds, fences! Light, handy—even youngsters use it! Grass Trimmer Attachment.....\$9.95

FREE! \$20.00 SAVINGS CERTIFICATE with your 6-in-1 Routo-Jig! Saves you \$7.00 on Shaper...\$3.00 on Sander...\$3.00 on Plane...\$3.00 on Grass Trimmer...\$4.00 on Dovetail Templet. You save on *every* attachment, whether you choose one or all five! See your dealer or write for complete details. Offer expires January 31, 1957.

PORTER-CABLE MACHINE CO.
6150 N. Salina St., Syracuse 8, N. Y.

Yes, send me complete information on the Model 140 Routo-Jig, and the name of my nearest dealer.

Name.....

Address.....

City..... Zone..... State.....

Porter-Cable
Quality Electric Tools



Smooth
Engine Power
calls for Quality Bearings . . .

FEDERAL-MOGUL QUALITY!

You, too, can have the same lively, dependable power vital for emergency vehicles, when you replace worn engine bearings with Federal-Mogul QUALITY bearings. They are engineered to stand up under heavy explosive impact loads and to restore snappy power, pick-up and economy!

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PRECISION MANUFACTURING • SERVICE



A Trucker's Toughest Trick

[Continued from page 144]

the logs are covered with snow and ice. They shift easier."

"Did a load ever shift on you?" I asked.

Gus grunted. "Just once," he said. "All of a sudden we started tipping over, cab and all. For a minute, I didn't know what was wrong. Then I realized the load had shifted. Luckily, we were on a fairly level stretch. But I hardly had time to shut off the engine before the left door was scraping the ditch and I was having to reach straight up for the right door handle. Just at that minute, the binder gave way, the load rolled off, and the cab righted.

"How many shifts have I made so far?" he asked me abruptly.

I counted. "Twenty-one."

"And we've gone about three miles," he said. "It would have been a lot more if this had been winter, or early spring, when the roads are soft. Guy rode with me once counted 125 shifts in 22 miles."

Rolling in high. We rounded a curve onto a strip of level road. Gus, sometimes moving both gear-shift levers at the same time, with his hand entirely off the steering wheel for an instant, moved through third overdrive to fourth direct and finally fourth overdrive. We were doing 35 mph.

"Is this about your top speed?" I asked.

"She'll do between 38 and 40," Gus said. "Governor on the motor won't let her do more."

The truck rumbled through a hushed grove of silent hemlocks that stood as tall as steeples. A doe frisked out of the trees ahead and skipped across to the opposite bank, where she stopped casually to nibble a new leaf.

My face must have shown the delight and awe of the city dweller suddenly confronted with simon-pure wildlife, for Gus said, "That's nothing. I've seen bear, wildcat, beaver and porcupine."

"Would you rather drive on company roads with a big load of logs than drive, say, one of those huge produce trucks on the state highway?" I asked.

Trucker's choice. "And how!" Gus ex-

[Continued on page 246]

IDEAS FROM WELDWOOD

THIS MONTH'S PROJECT—

DRESSING UP A FIREPLACE WALL



The Weldwood Question Box

Q. I have a sort of "free form" curved bar in my cellar, and I would like to wood panel it. Is there any way I could bend wood paneling to fit curves?

A. Yes. If the curves are not "too curvy," you can use ordinary Weldwood hardwood plywood paneling. Use $\frac{3}{8}$ " thick paneling—available in a wide range of woods)—and nail it on or attach with Weldwood Contact Cement. Paneling $\frac{3}{8}$ " thick has enough "give" to bend to some degree. If, on the other hand, the curves are too acute, the only other method is to groove the back of the panels to allow them to bend.



Weldwood®

A product of

United States Plywood Corporation
Weldwood—The Best Known Name in Plywood

Look what Weldwood paneling and a dash of imagination did for this 1926 living room! Weldwood paneling really makes a remodeling or modernization job a snap. In this room, Cherry V-Plank* paneling was used. The big 4' x 8' panels go up quickly and easily, are grooved to give that random-plank effect. And the grooves are spaced to fall on 16" centers and hide nail holes. (Paneling may be installed *without* nails by using Weldwood Contact Cement.)

Weldwood paneling, you know, ends forever the need of painting or redecorating. It's a one-time investment—and not a very high one, at that. For example, in this room, all that Cherry V-Plank—including that used as facing for radio-phonograph compartment (left) and desk-bookcase unit (right)—costs only \$107. That's the first and the final cost!

Remodeling this room is the featured project in the latest issue of Delta Power Tool's "Deltagram." To get your copy—which even includes step-by-step directions for making all the built-ins—just send coupon.

*Trade Mark

This Month's Hints

1. Your breadbox will do double-duty if you follow this suggestion. A piece of Weldwood plywood attached inside the door of a front-opening breadbox serves as a bread cutting board whenever the door is opened. Attach plywood to door with Contact Cement,

or drill and use nuts and bolts. R. W., Union, N. J.

2. $\frac{1}{4}$ " and $\frac{3}{8}$ " scraps of Weldwood Plywood can be cut into triangular shapes and used as gussets to strengthen the corners of window screens, shipping crates, doors, etc. L. M., Lincoln, Indiana.

This method is tricky and we would recommend it only to experienced woodworkers.

HAVE A QUESTION?
Send it to "The Weldwood Question Box," 55 West 44th Street, New York 36, N. Y.

\$10 for your Ideas
for "This Month's Hints." If accepted for publication, Hints must apply to some Weldwood product. Send them to "Weldwood Hint Editor," 55 West 44th St., New York 36, N. Y.

United States Plywood Corporation
55 West 44th St., New York 36, N. Y.

Enclosed find 10¢ for remodeling issue of the "Deltagram."

PS10-56

NAME.....

ADDRESS.....

CITY..... STATE.....

A Trucker's Toughest Trick
(Continued from page 24)

claimed. "Course, those guys never get more than a seven-percent grade—and there's a whale of a difference between seven and 15 percent. But they have to drive in city traffic. Boy, they can have it! I'll take 250,000 pounds of logs and a dirt road to myself in place of their 72,000 pounds—that's the legal limit in Washington on the highway—and heavy traffic, any day."

We rolled down a slight hill and thundered across a log bridge, high above a slate-green, foaming stream rushing toward Puget Sound.

"It's a long way down," I remarked.

"Ninety-two feet, to be exact," said Gus. "But don't worry. These log bridges are all built to take 500,000 pounds."

By now the character of the road had changed. It was wide—30 feet—and black-topped. We sped along at 35 to 38 m.p.h., mostly in fourth overdrive.

But as we neared the mill, 22 miles from the landing, the terrain began to slope steeply again, and Gus was kept steadily busy shifting, braking and applying water to his hot brake linings.

A bad spot. On the last downgrade, I spotted a single railroad track emerging from the woods on the right and disappearing into the foliage on the left.

"This is a bad spot," Gus said. "Especially in winter. There are only two trains a day, but they run anywhere within an hour of schedule. You never know when one's going to pop into sight, and with all the noise we make, it's hard to hear those diesel horns."

We got over the track safely, however, and rolled into the mill yard and up to the unloading platform.

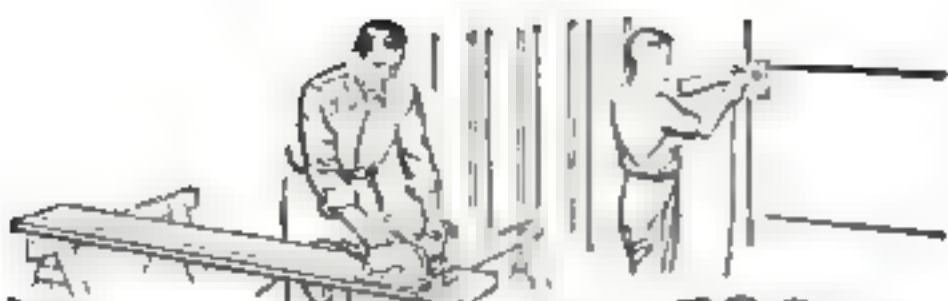
"How many shifts?" Gus asked.

I counted scrawls hastily. "Sixty."

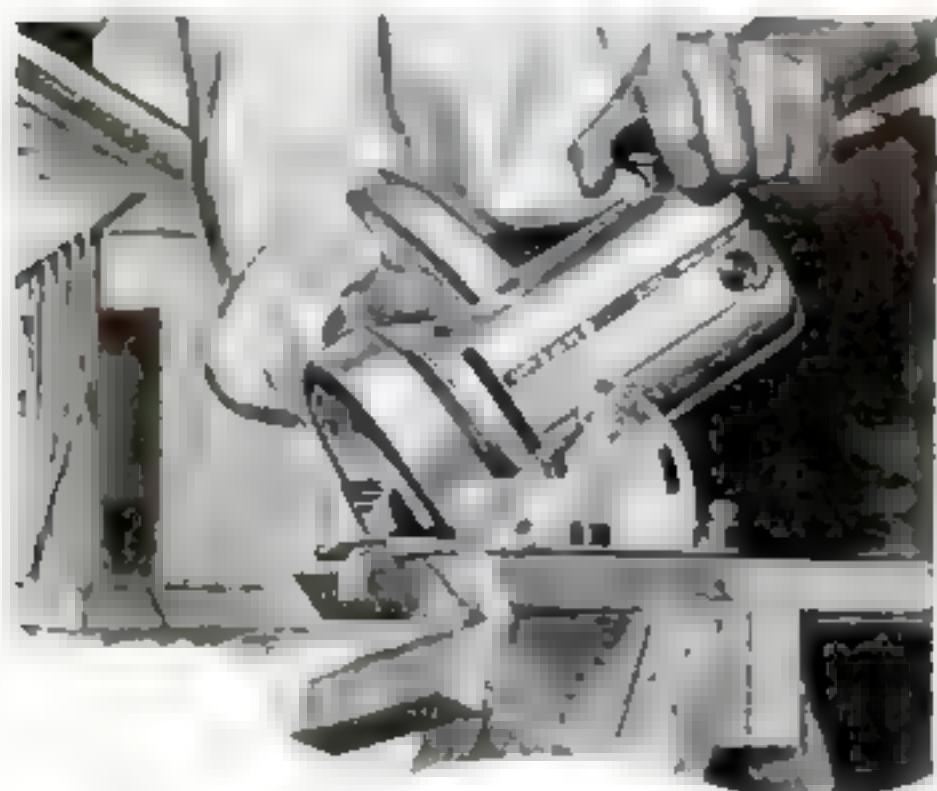
"It was a cinch," he said. "Better come back and try it again in the winter."

"No, thanks," I said firmly.

"Heck, it's not so bad," he said. "We didn't have a single lost-time accident all last year. Only one driver got hurt." Gus laughed. "Sprained an ankle on a loose rock when he got out of his cab." **END**



WIZARD POWER TOOLS ...built to make it and take it!



WIZARD 6 1/2" PORTABLE SAW: Cuts 2x4 at 45°. Adjustable cut to 21/2". Powerful 7 amp. motor. Special slip-clutch prevents motor burn out. With rip guide and safety guard **\$39.95**

Other models \$29.95 to \$52.95

Team up with WIZARD for a faster, easier job. These rugged tools are compact, easy to handle, yet big enough for any home project. Check the complete line of power-packed WIZARDS at your nearby Western Auto Store before you buy any tool...then

JOIN THE MILLIONS WHO KNOW THAT YOU GET MORE TOOL PER DOLLAR WITH WIZARD THAN WITH ANY OTHER NATIONAL BRAND!

WIZARD 1/2" DRILL:

Powerful, 2 amp. motor. Geared chuck. Locking trigger. Accessories and kits available. **\$19.50**

Others \$12.50 to \$49.95



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More road horsepower for hill climbs! Bob Unser sets a new record in 1956 Pikes Peak Hill-Climb Race in car powered with Jaguar engine and Champion spark plugs. Champions give him more power in his family car, too!

New Champion spark plugs can increase road horsepower by 24%!

Tests show new Champions can give you an immediate boost in road horsepower if you have driven about 10,000 miles without a spark plug change

Whatever make of car you drive, you'll be amazed at the difference in performance a set of new 5-rib Champions can give you.

That difference has been proved conclusively in tests by independent engineers. When they put new Champions in cars whose plugs had gone 10,000 miles or so, there was an immediate increase in road horsepower—the real power actually

delivered at the rear wheels! The average gain for all cars tested was 24%!

There just never has been a spark plug to match these new 5-rib Champions! Replace your old plugs with new Champions today. You'll feel the difference at once!

CHAMPION

LOOK FOR THE 5 RIBS



ORDINARY ELECTRODE



POWERFIRE ELECTRODE



New Powerfire electrode stands up better in today's engines. Photo shows how ordinary electrode (left) burns away. Champion's Powerfire electrode (right), after identical use, is still good for miles of powerful, full-firing performance.



"We put **TWINSULATION** in our attic... and are we glad!"

"Our house stays warm all winter—fuel bills have dropped 25%."



"Upstairs rooms stay comfortably cool all summer."

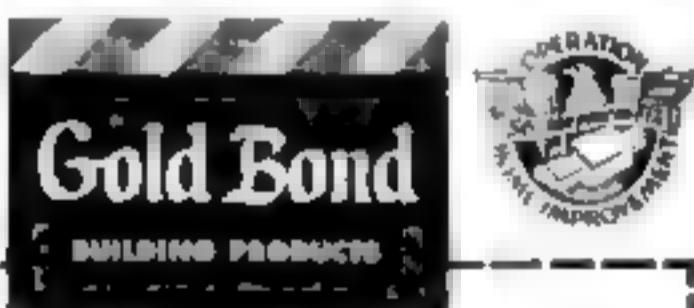


"We did it all in one afternoon, and even I put up part of it."



Two insulations in one, **TWINSULATION®** combines rock wool (to block heat), aluminum (to reflect heat). Gold Bond wraps an aluminum covering all around thick blankets of rock wool. That's why **TWINSULATION** cuts winter fuel bills up to 25%, keeps your home up to 15° cooler in summer. Easy to handle, easy to put up. See your nearest Gold Bond® dealer. He's listed in your October 1st issue of *Life* magazine. Look him up... soon!

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Buffalo 2, New York

I enclose 10¢ for "Home Insulation" booklet.

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Street _____

City _____ State _____

New Ford—Only 4 Feet 8 Inches High *[Continued from page 101]*

Redesigning the differential saved three-quarters of an inch in the height of the drive shaft tunnel—there's that much more difference between the center line of the ring gear and that of the pinion. Reducing the diameter of the drive shaft at the rear end saved five-eighths of an inch.

And, of course, six-tenths of an inch in car height was gained with the new 14-inch wheels. That's how much the rolling radius of the tire is reduced.

Practically everybody's first reaction to the lowering of the roof line is: okay, but how do you get into the thing?

Relax. It's easy. Before trying entry, I suspected that it would take a professional contortionist to get himself seated. It doesn't.

Lowering the roof brings benefits other than looks. Maybe the most important is raising the "roll center," that imaginary pivot-point at which the car leans toward the outside of a hard turn. The new Ford goes around curves as though it were on rails. That's because the center of gravity went down with the roof. It would take an awful lot of push to induce this car to turn over.

Bringing down the height of the car produced some happy by-products. With a poverty of weight topside, it is less inclined to rear back on its haunches like a scared alley cat in a hard-throttle start, and it doesn't act like an Olympic diving champion in panic braking.

Finally—and here's that second big change in the new Ford—lowering the roof line forced the suspension engineers to do some soul-searching on springing. When they got through with their job, the car rode softer on the boulevards and yet sacrificed little to the performance on secondary, washboard roads.

The Ford people have incorporated a number of subtler improvements, too.

A bucketful of rubber pads has been used to insulate the body of the car from the chassis. This not only reduces "road shock" but markedly cuts down noise.

[Continued on page 250]

PORTABLE LIGHT PLANTS

1500 WATT PLANT 115V. 60 cyc. AC Push Start. Powered by a 6 1/2 hp. Clinton engine. Combined big output with easy portability. Provides emergency power for operating any oil burner, pump pump, freezer, television, lights, minimum voltage systems, etc. which require up to 1500 watts. Item 22. Wt. 110 lbs. Reg. \$475.00. Factory price \$239.50
1750 Watt Plant Powered by 4 1/2 engine. Electric starting & battery charging by 115V. Factory price \$279.50
MASTER-LITE 2500 Watt Plant 115V. 60 cyc. AC A.C. Push Start. 100% portable. Can be started by rope or by 115V. Electric starting. Item 23. Wt. 110 lbs. Reg. \$475.00. Factory price \$329.50
3500 Watt Plant Push Button Start (Item 23) 115V. 60 cyc. AC. Up to above last larger output. Reg. \$475.00. Factory price \$379.50
DUAL VOLTAGE 115/220 for Item 21 or 22 \$165.00

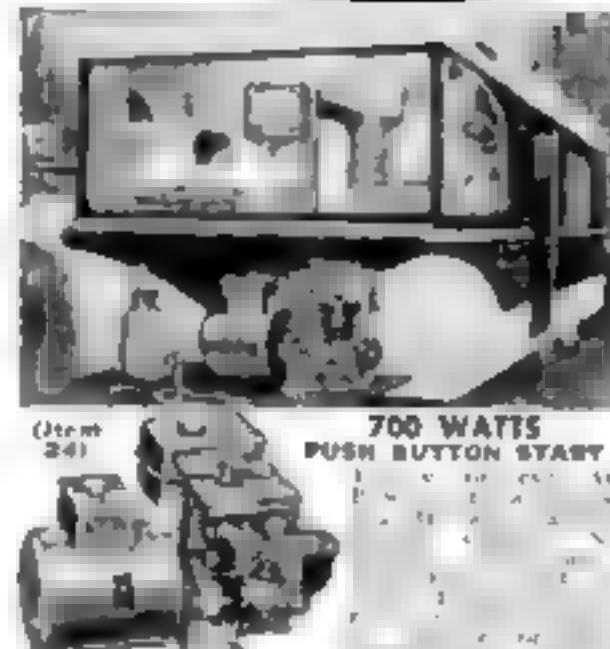
1 TON HYDRAULIC PRESS

1 TON HYDRAULIC PRESS. Self-tensioning rods, etc. bent completely. Push button start. Item 24. Wt. 70 lbs. Reg. \$329.50
SCREW TYPE PRESS. Nine ton capacity. Reg. \$695.00. Item 25. Wt. 150 lbs. Item 26. \$49.50
EXTENSION CORD
100 ft. 10-3 power cord. 115V. 60 cyc. 10A. Neoprene 14-Strand. 20 year quality. Wt. 12 lbs. Item 185. 100 ft. Complete with rubber plug. Cord outlet. A ten-ciffle box at only \$8.95
No. 10-3 POWER CABLE. Heavy duty, very flexible, rubber covered. 50 ft. w/ male and female fittings. Wt. 9 lbs. Item 5. 250 ft. \$10.45. 50 ft. w/ both fittings (Item 502). \$9.45
No. 12-3 POWER CABLE. Very flexible rubber covered, special outside shield for grounding power tools, etc. 50 ft. (Item 199) wt. 8 lbs. \$6.95. 100 ft. (Item 200). \$10.95
No. 14-3 Conductor Power Cable. heavy duty very flexible, rubber covered, with 8 contact plug & socket. Ideal for tractor-tiller connections (Item 780). 15 ft. \$6.95

MASTER DC ARC WELDERS
WELDER ONLY - DUAL CONTROL MODEL same as above but does not have the gas control of 4 1/2 hp. Item 28. Wt. 110 lbs. \$119.50
WELDER ONLY-INDUSTRIAL MODEL same as above but with ceramic rotary type rheostat providing 74 different heat settings for all types of welding (Item 38b). \$139.50
COMPLETE POWER WELDER same as above powered by a 14 1/2 hp. air-cooled engine. Wt. 450 lbs. Item 24. Reg. \$500.00. Value \$449.50
WELDING KIT Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at \$10.50

BUY at FACTORY PRICES LESS THAN WHOLESALE

direct from
MASTER MECHANIC



(Item 24)

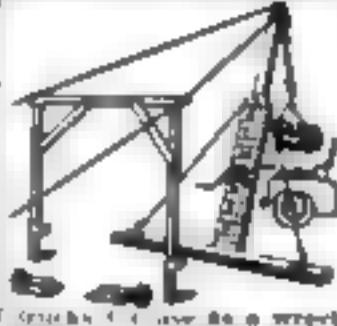
700 WATTS
PUSH BUTTON START

Up to 700 watts. Ideal for television and radios. Complete with voltmeter and push button start. Power up to 1000 watts. \$143.50

1500 Watt Plant (Item 23) same as Item 24 but larger generator and engine. \$199.50

We make every type and size of light plants to your specific requirements.

PORTABLE BOOM HOIST



Here is a portable boom hoist. It can be used for moving materials, etc. It can be mounted on a truck or on a tractor. Designed for easy mounting in front or rear of truck. It has a swivel or mobile eye. The boom is 10 ft. long. It can be folded up to 10 ft. 6 in. and 10 ft. 10 in. It is ideal for erecting buildings, handling materials, loading machines, etc. in rear of car, lifting train cars, lifting in water, laying in sewer pipe, etc. Item 300. Wt. 150 lbs. Reg. \$150. Special \$110. Shelby, Ohio. \$89.50

Double Acting Hydraulic Cylinder



A powerful cylinder made by Master Hydraulics developed with a finishing and a pulling arm. Wt. 110 lbs. Item 17. Wt. 100 lbs. \$17. Pump pressure 1000 psi. 100% efficiency. Standard heavy duty fittings on both ends. Has standard 1/2" x 1" thread openings. Can be used for lifting tanks, etc. Master, in case of lowering implements etc. hydraulic pressure etc. can also be used as an air cylinder. Item 302. Wt. 17 lbs. Reg. \$100. Value \$85.00. Special \$14.95

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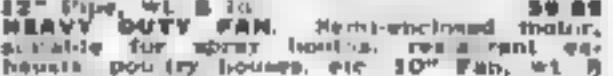
JET STEAM MASTER

100% efficiency. 100% reliability. 100% satisfaction. Produces a large volume of high pressure steam. Fully automatic. 100% built-in water circulating pump. Draws water from bucket or bucket. Automatic and safety valves can use it bush in safety valve. Comes up with 12 ft. of high pressure steam hose and new triple efficiency steam gun that automatically mixes in soap solution. If desired Wt. 250 lbs. Item 400. Special factory price \$345.00

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Rugged, ball bearing Winch



100% efficiency. 100% reliability. 100% satisfaction. 100% built-in water circulating pump. Draws water from bucket or bucket. Automatic and safety valves can use it bush in safety valve. Comes up with 12 ft. of high pressure steam hose and new triple efficiency steam gun that automatically mixes in soap solution. If desired Wt. 250 lbs. Item 400. Special factory price \$345.00

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MASTER MECHANIC MFG. CO., Dept. 62-B, Burlington, Wis. Catalog \$3.50

OCTOBER 1956 245

New Ford—Only 4 Feet 8 Inches High
[Continued from page 245]

And power? Oh, that again! Well, if more power is an improvement, the Ford is better than ever. The holes in the engine blocks are the same size, but the compression ratios are up again to extract more horses from the pistons.

The count (all ratings with automatic transmission): 312 cubic-inch engine, 245 horsepower at a 9.7:1 compression ratio, a boost of 20 horsepower; 292 cu. in., 212 hp. at 9:1, up 12; 272 cu. in., 190 hp. at 8.6:1, up 18; OHV Six, 144 hp., at 8.6:1, up 7.

Naturally, the oomph is reflected in the performance. Here are the acceleration figures for a standard four-door sedan, powered with Ford's 312-cu. in. engine, with 200 pounds aboard:

Zero to 30 m.p.h., 3.6 seconds, an improvement of .4 seconds over 1956.

Zero to 60 m.p.h., 9.6 seconds, better by 1.1 seconds.

Forty to 60 m.p.h., 4.3 seconds, better by .7 seconds.

The fatter tires undoubtedly shave down the performance.

The added resistance to capsizing is not the only new safety factor in the new Ford. A recessed ash tray has an eyelid cover; panel controls are recessed.

Ford continues to offer the safety features it advertised so widely in 1956—the deep-dished steering wheel, safety door locks and, optionally, padding in the driving compartment and seat belts.

Like a Swedish smörgasbord, Ford for '57 has something for everybody. You have your choice of two wheelbases, two frames, two body lengths. You can still get an in-line, six-cylinder engine and any one of three different flavors of V-8s. You can play eeny, meeny, miney, mo among five "lines" of cars on the showroom floor, progressively expensive, and you have a choice of 19 body styles.

If all this won't reduce a buyer to a state of nerves in a flap of indecision, Ford for '57 has goofed.

END

BUILD YOUR OWN *Electro-Voice* HI-FI SPEAKER CABINET!



Assemble a Unique Corner Folded Horn

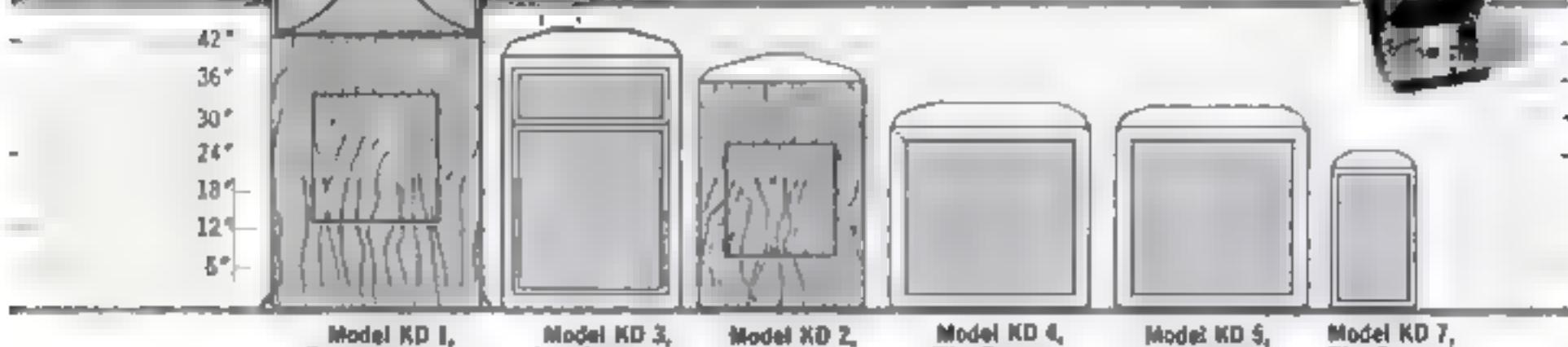
Electro-Voice KD Kits make it easy to build any of seven single- or multiple-speaker high-fidelity speaker enclosures. Kits contain everything you need, pre-cut, partially assembled pieces, glue, screws, tools. Priced from \$26 (the Baronet kit) to \$118 (the incomparable Patrician Kit).

Illustrated, step-by-step instruction books, 75¢ to \$1.50. Finishing kits, \$5.

E-V's BUILDING BLOCK PLAN

Here's how to step-up from a single speaker to a multi-speaker high-fidelity system one economical step at a time! Start with an Electro-Voice coaxial speaker, add matched components as your budget permits.

Hear what you can have: See your Electro-Voice Dealer, dial the E-V Systems Selector and listen to the improvement as each component is added to your basic speaker.



Model KD 1,
The Patrician IV

Model KD 3,
The Centurion

Model KD 2,
The Georgian

Model KD 4,
The Regency

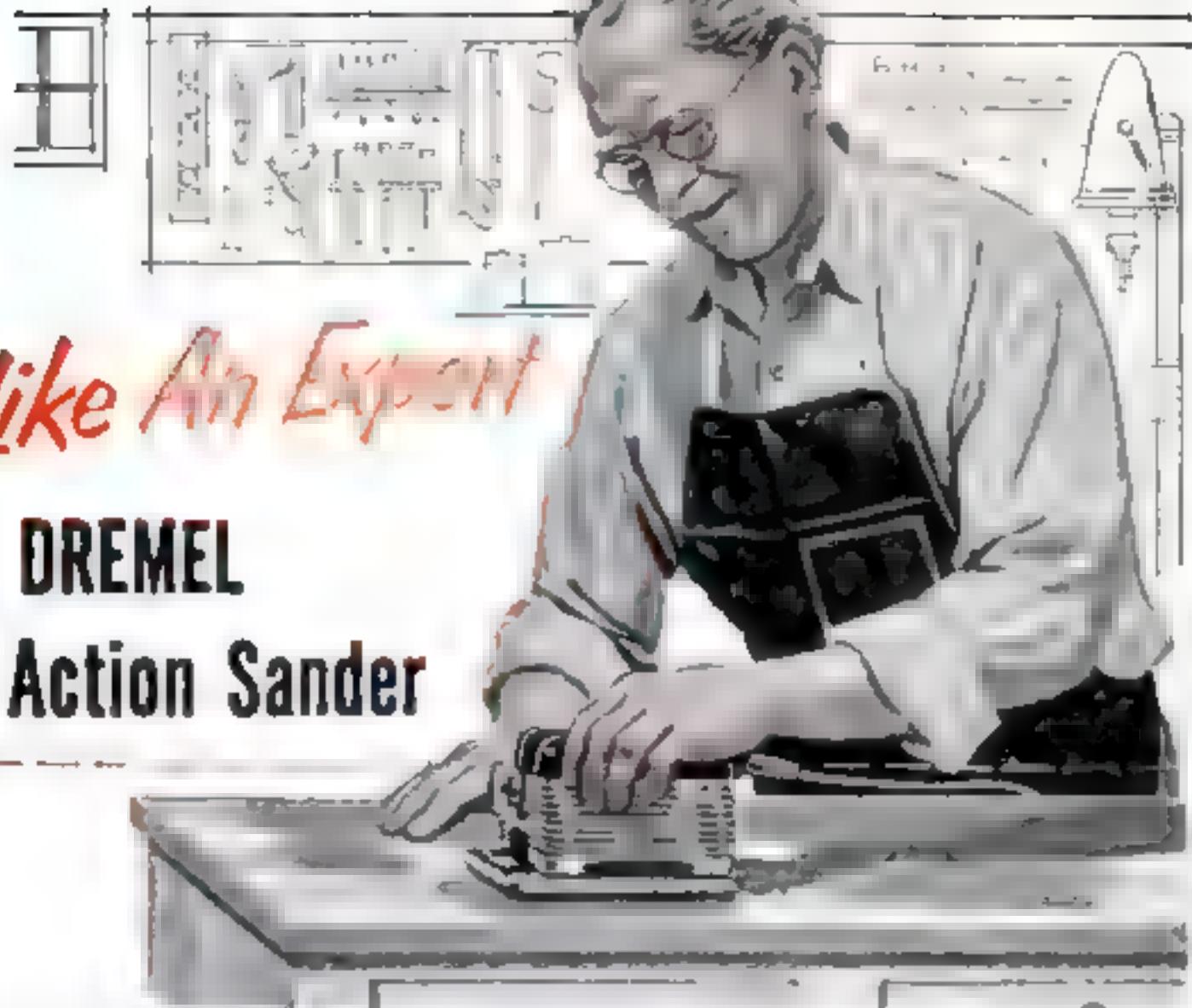
Model KD 5,
The Empire

Model KD 7,
The Baronet

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Sands in a Straight Line

The Dremel duplicates the back-and-forth motion the old-time craftsman always used when he sanded by hand — before he had a Dremel. That's the secret of getting a finish that is smooth as glass.

Other sanding motions sand across-the-grain — leaving scratches and orbital swirls. These become especially noticeable when you stain, varnish, or lacquer and spoil the finished appearance of your wood.

That's why so many experts — and novices, too — insist on a Dremel for sanding woodwork.

furniture, cabinets, boats, wood paneling, and many, many other projects.

You Can Polish, Also

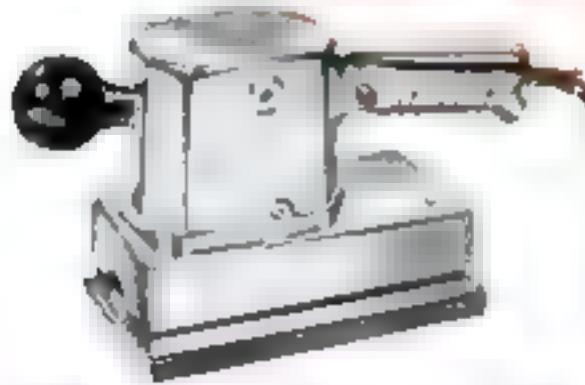
You're not limited to sanding, with a Dremel. You can remove the sandpaper and slip on a polishing pad.

Then you're all set for speedy, effortless polishing of furniture, your automobile, or any other waxed surface.

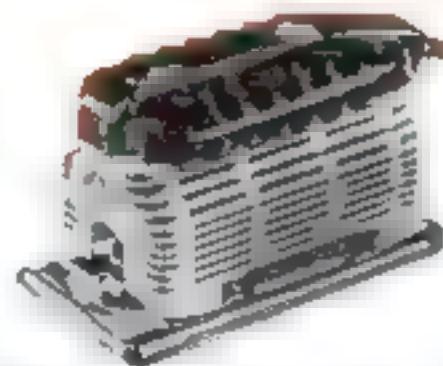
Dremel Straight-Line Action Sanders are available in three sizes. See your local power-tool dealer and ask for a demonstration. Compare with other makes for price, performance, simplicity of construction, and ease of handling. A close-up comparison will convince you that a Dremel is your best all-around buy.

See the Dremel at your hardware store.

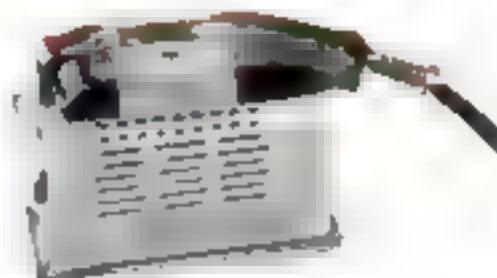
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Model 53. Heavy-duty unit designed for rough, medium, or fine sanding. Powerful ROTARY MOTOR will not stall or burn out. 24 sq. in. sanding pad. Wgt. 5 1/4 lbs. Easy handling. \$34.85.



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The World's Longest Bridge
[Continued from page 10.]

bridge built thus far—\$99,800,000. This is because of the almost impossible weather and geological conditions the site imposes. The bridge is being built right in the middle of a 40-mile long funnel that connects two great weather factories—Lake Huron and Lake Michigan. Mackinac Straits spout weather at both ends, sometimes simultaneously.

Of the bridge's 34 piers, 32 had to be built in the water and had to go down 200 feet to reach bedrock. The towers rise 552 feet—about the height of a 50-story skyscraper. Last fall they were hit by storms that brought 72-m.p.h. winds, waves that threw water 40 feet high.

Remember a tower is a cellular shaft of steel standing on end. Whenever wind hits, its push is multiplied by the shaft's height and develops almost incomprehensible toppling power. The wind turns the whole tower into a gigantic lever, and works that lever with a total effect of more force than two diesel locomotives

—now this way, now that, trying to knock it down.

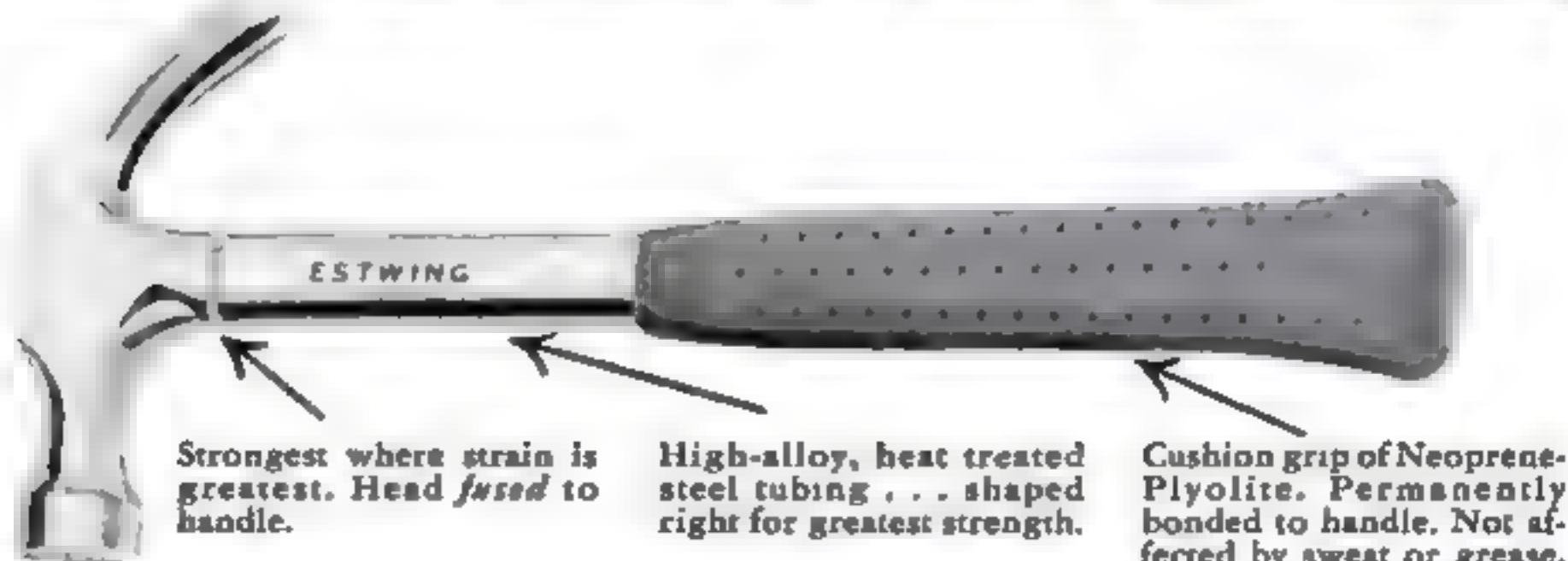
What blocks the wind here is an ingenious development in metallurgy—high-strength anchor bolts of silicon steel. There are 68 of them in each of the two legs of each tower. They are four inches in diameter, 20 feet long, and weigh 1,000 pounds each.

Dreaming up in advance all the windy nightmares the towers would have to live through, the engineers figured that each of these bolts must grip with a tension of 300,000 pounds. And the thread of the nut, a little ribbon of metal, was made to withstand that much tension.

In contrast with the early trial-and-error methods of bridge-building, today's engineers with the help of new materials and modern mathematics can load a bridge before they build it. "A bridge," Dr. Steinman says, "is mathematics brought to life." Mathematically, in his

[Continued on page 254]

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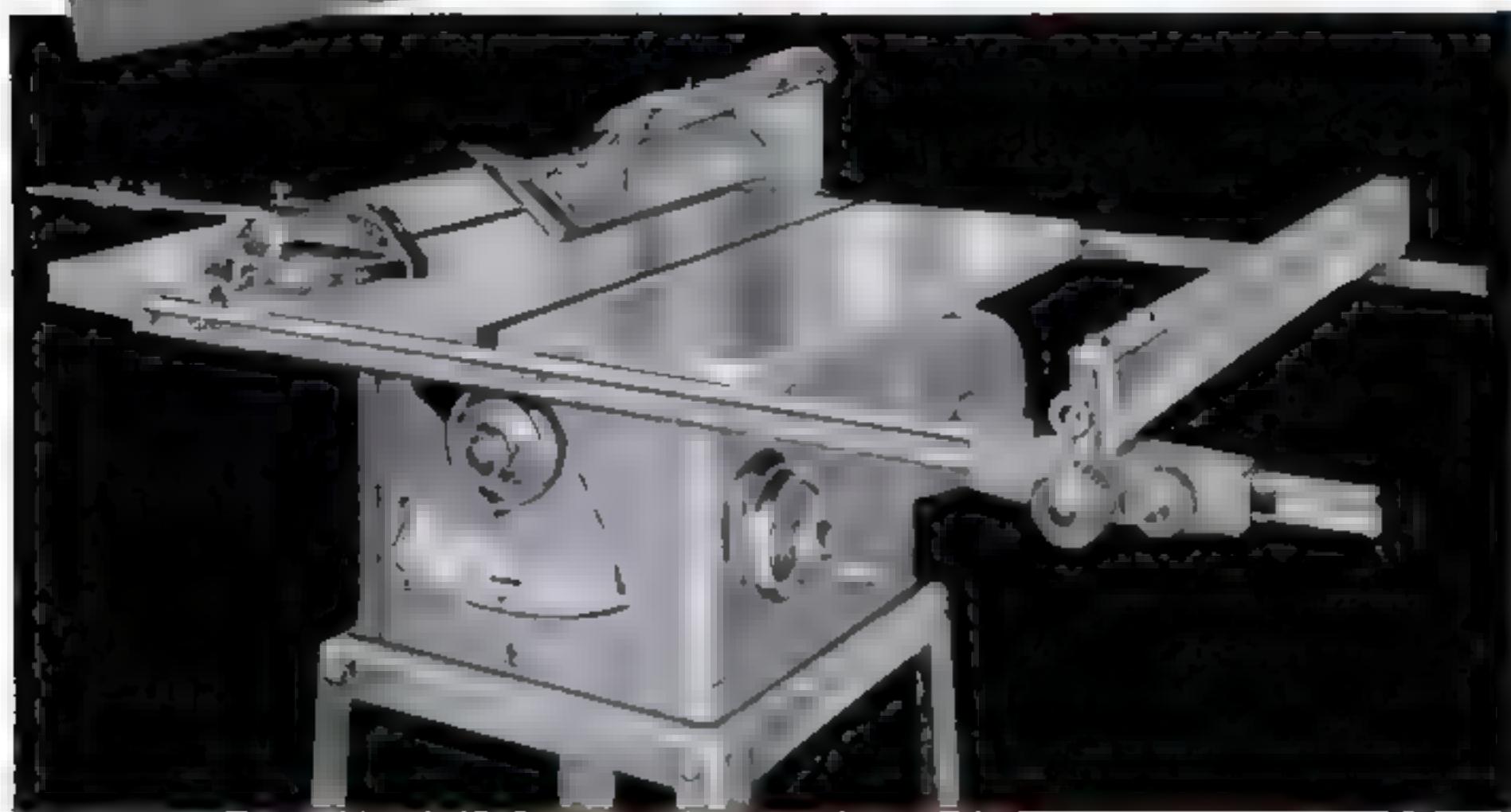
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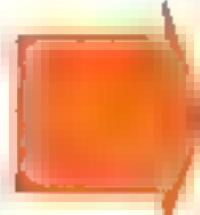
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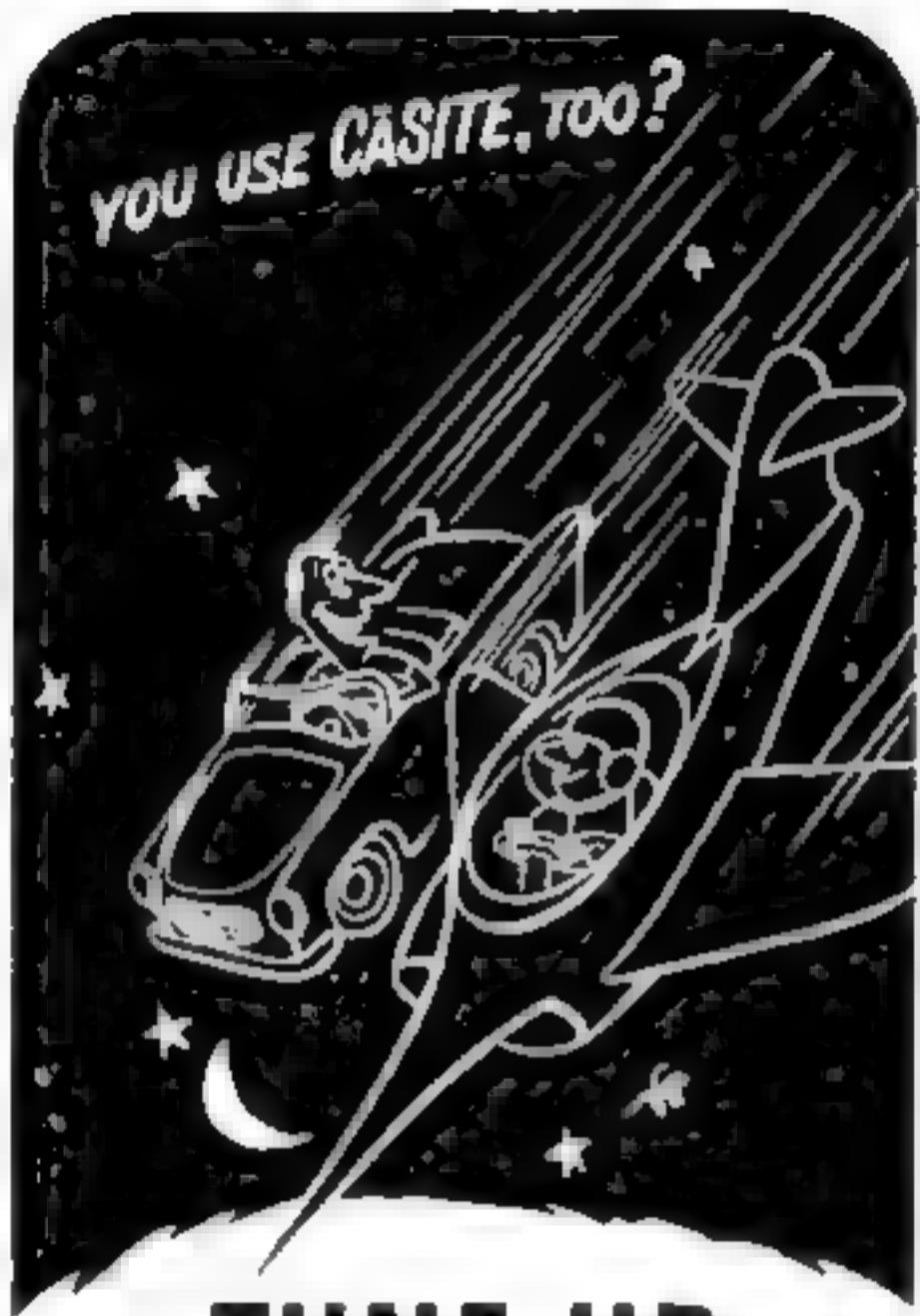
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The World's Longest Bridge [Continued from page 252]

office, Dr. Steinman can put a truck on the roadway of the bridge. The weight of the truck soars up the cables, pushes down on the towers and pulls on the anchorage. It runs out over the beams of the roadway and down the piers

The engineer studies his mathematical truck at rest in a dozen different positions upon a section of the bridge. Then, with pencil and paper, he moves the truck from section to section. Then he rolls it over the bridge, considers its impact as it starts, stops, bounces. Then he multiplies by the number of vehicles the roadway can hold.

About 100 men working under Dr. Steinman designed the Mackinac Bridge. To show you how far their mathematics took them, they told the contractor precisely how many one-inch-bolts to put in one member and, to save the price difference, how many seven-eighths-inch bolts to put in another—and at precisely what tension: 42,500 pounds for the one-inch, 32,400 pounds for the seven-eighths.

When the untutored see a bridge they see something that just stands there. The engineer sees a majestic drama. He sees the bridge's members upholding all the various loads, safely balancing them, and huffing and puffing as they do so, bulging their molecular muscles, stretching, bending. In times of strong wind the cables hum defiant sounds.

"*Harmony with environment, internal harmony, composition, symmetry, clarity, simplicity, grace, proportion, rhythm, contrast*"—these are a few of the elements Dr. Steinman considers in building a bridge. But not until he has considered, first, the bridge's capacity to do its job and, second, its capacity to do it at minimum cost.

Certainly the silhouette of the modern steel suspension bridge—two great opposing arcs balancing slenderly—is among the most graceful sights man has ever created. But in designing the silhouette, bridge builders use arcs for a

[Continued on page 256]

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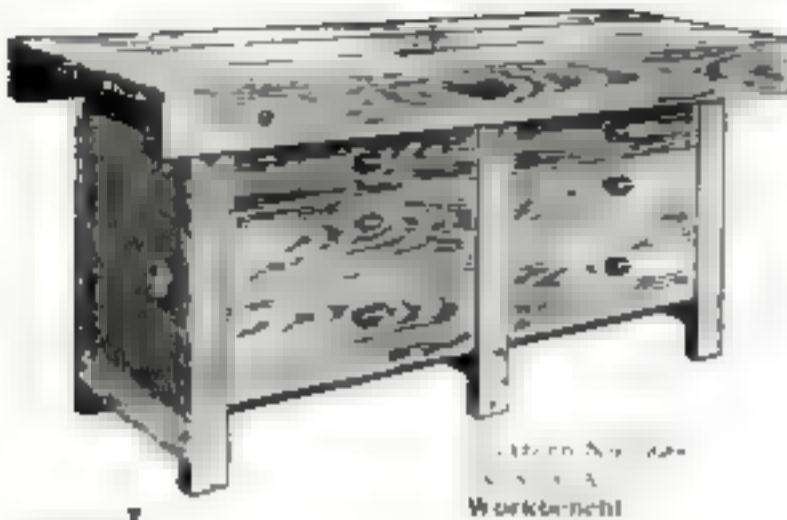
Genuine Ford Batteries, like *all* Genuine Ford Parts, are made to the exact specifications set by the men who first built your Ford.

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BOOKLET

The World's Longest Bridge

[Continued from page 254]

practical rather than an esthetic reason. If the cable were perfectly horizontal, there would be nothing to counteract any vertical force.

The roadway is designed to arc upward to provide passage for ships and to allow for the effect of temperature on steel. There are 42,800 miles of wire in the cables of the Mackinac Bridge. The cables sag 10 feet lower in summer than in winter. The roadway, of course, is expanding in the same heat. But, because it arcs upward, in expanding it merely becomes flatter, going deeper into sliding joints at either end.

How do you keep an expanding and contracting bridge motionless in relation to supports that do not move in the same way or to the same degree? Those steel plates you bump over every so often on the roadway are one way. They are the sliding joints where the expanding and contracting roadway slides in and out.

An ancient, grim law among bridge builders has been: "The bridge demands a life." Usually it demanded lives when the men were in the process of putting the great spans onto the foundations. In 1907, in a crash during the erection of the Quebec Bridge over the St. Lawrence River, 82 men died. Nine years later work was resumed and another method tried: the span was jacked up from barges on the water. The span slipped off its end support and 13 men died.

But a span 472 feet long was put on its foundations in Mackinac Straits without anybody drawing a tense breath. They built the span on falsework on a group of barges to stand a few inches too high when in place. Then the barges were floated to the foundations and gingered into position. Water was pumped into them. As they sank deeper into the water, they lowered the span onto the foundations.

Although 170,000 railroad bridges and an estimated 300,000 highway bridges have been built in the United States,

[Continued on page 258]

New SKIL Orbital Sander gives faster, smoother performance on every job!



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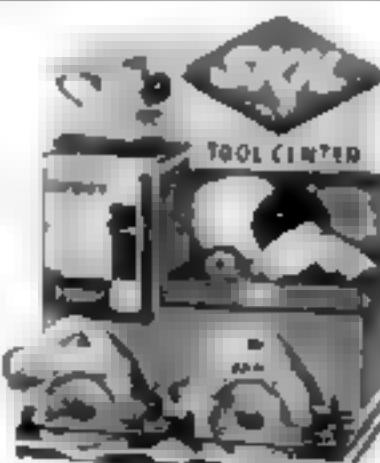


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they still retain many mysteries. One has been a tendency to sway and soar into the air, a phenomenon called aerodynamic oscillation. Nor does it demand a high wind.

The world's third longest suspension span—the ill-fated Tacoma Narrows Bridge at Puget Sound—oscillated aerodynamically in an 11-m.p.h. breeze. In 1940, four months after it was opened, it took off in a 42-mile wind and crashed. The great Whitestone Bridge in New York used to move so that it produced air-sickness in people trying to cross it in a 23-m.p.h. wind.

About 20 bridges completed since 1930 have been subject to disturbing oscillations. Some, including the Golden Gate and the Whitestone, had to undergo expensive alterations to stiffen them.

Dr. Steinman has analyzed wind mathematically to see how it lifts and twists bridges. The roadway on the Mackinac Bridge won't lift or twist. In designing it Dr. Steinman left a 10-foot open gap on each side of the roadway and put non-skid open grid metal flooring instead of concrete in the middle of the roadway.

Wind tunnel tests on a model proved that the bridge was aerodynamically stable in 600-m.p.h. winds.

Every bridge says in its structure a great deal about the nation and times of its builders. But this bridge says most about the America of today in the reason for which it was built. It connects the little town of St. Ignace with the even smaller village of Mackinac City. It was built chiefly for vacationers going to and from the still relatively unspoiled north woods on the peninsula.

During the hunting season last fall people crossing the straits were so numerous their cars formed lines totaling 27 miles in length and they had to wait 24 hours to get on one of the big 100-car ferries that kept up continuous service. Now they'll have Dr. Steinman's bridge to take them across—a magnificent testimonial to the everyday miracle of 20th-century America.

END



Pete Penn says:

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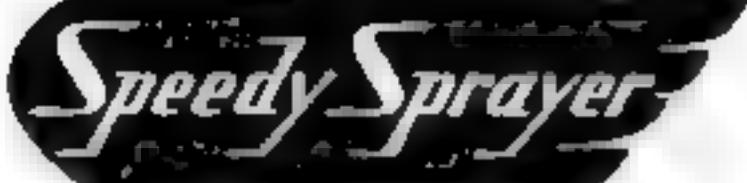
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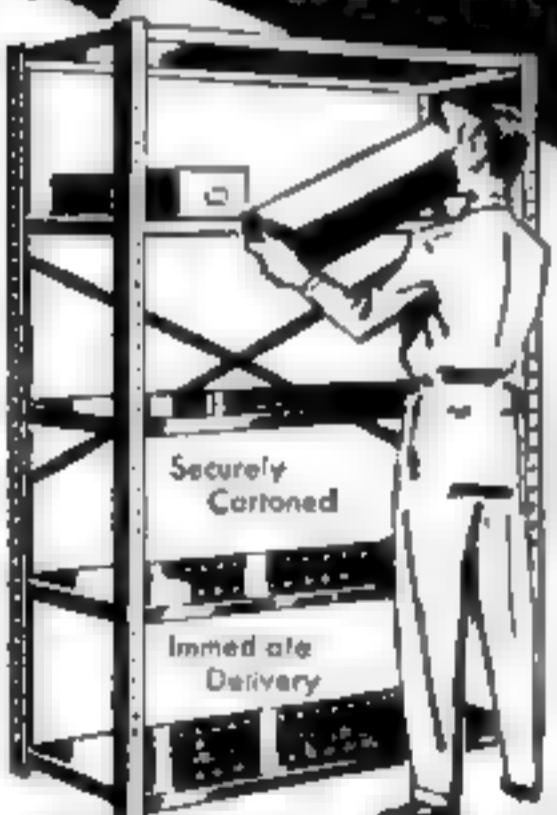
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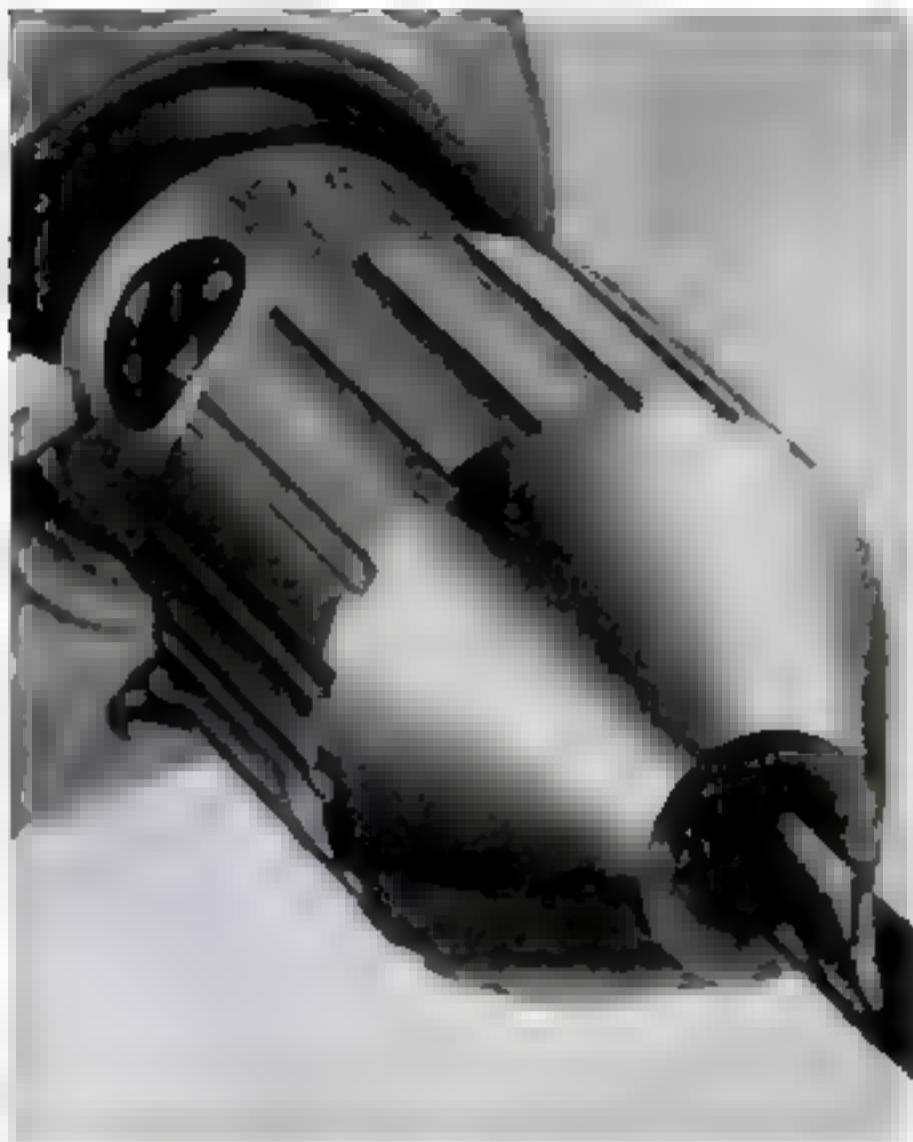
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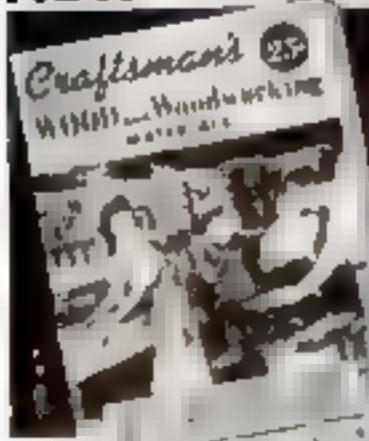
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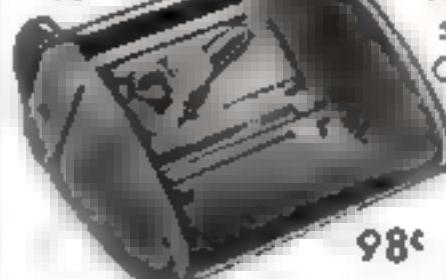
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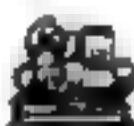
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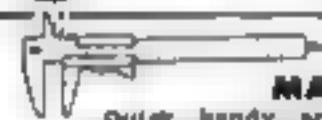


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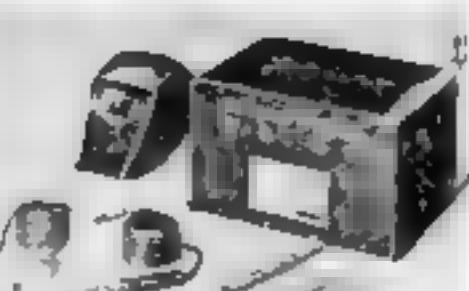


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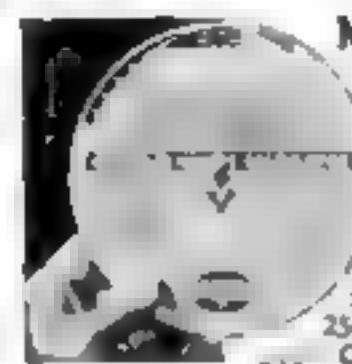


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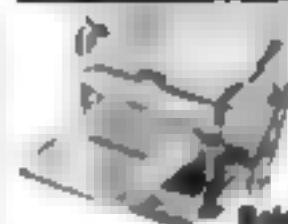
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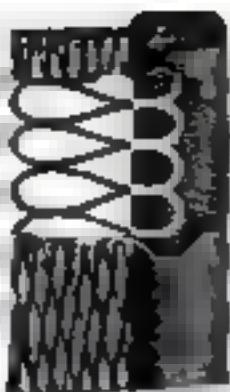
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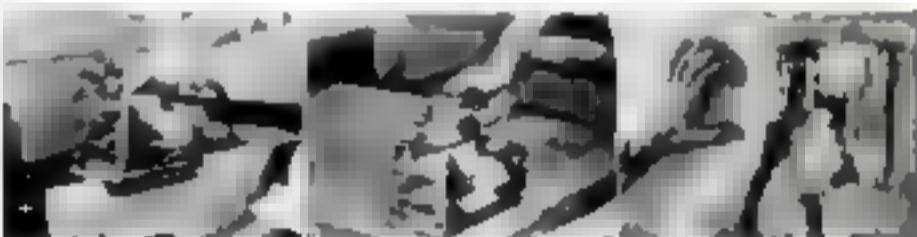
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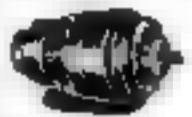
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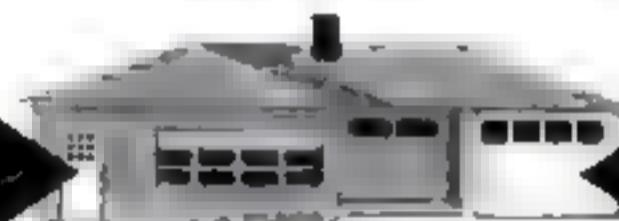
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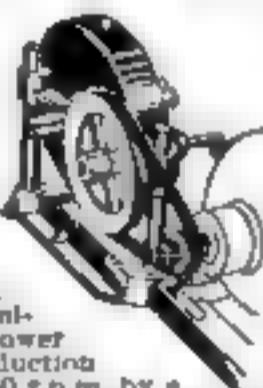
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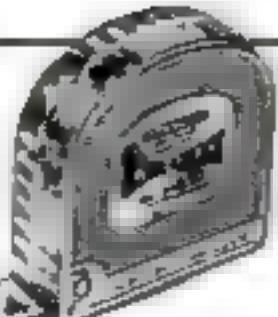
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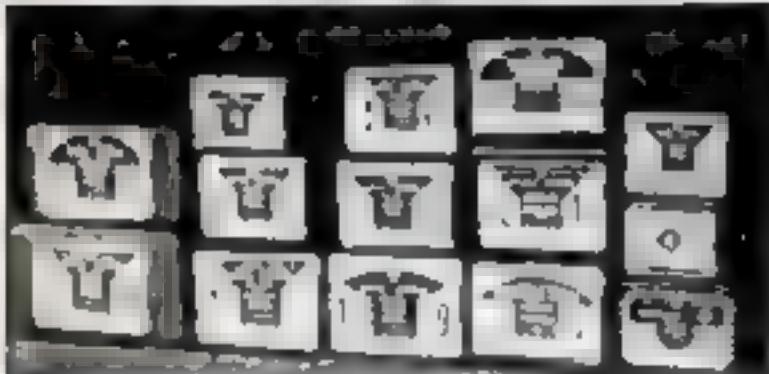
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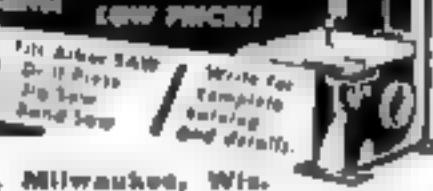
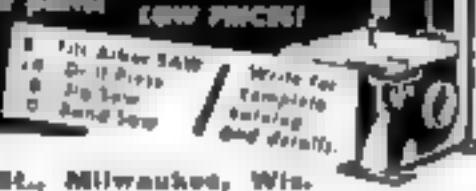
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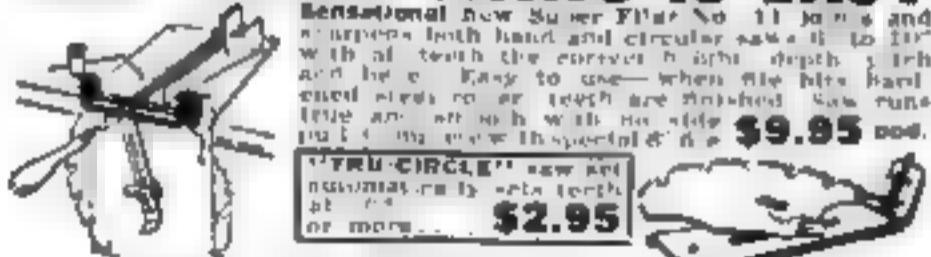
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GRINDS • CAVES • ENGRAVES
DRILLS • ROUTS • SHARPENS
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MOTO-TOOL**

The handiest tool you can own for household jobs, you, workshop or hobby projects. Handles like a pencil. It saves time—makes all jobs easier—gives the finished product a professional look.

The Dremel Moto-Tool has an excellent record as a precision tool in industry. Fastest, most powerful tool of its kind—27,000 rpm. Buy a Moto-Tool—it will pay for itself in no time. See your dealer today.



Model No. 2 (Wgt. 13 oz.)	\$17.85
Model No. 1	\$12.85
MOTO-TOOL KIT NO. 2 Includes Model No. 2 Moto-Tool, 16 accessories, chuck, tape, file, cutters, abrasive, polishes, etc., in a hard wood case....	\$25.95
All No. 1	\$21.50

SEE YOUR DEALER. If he cannot supply you, write direct from factory. Add 5 days for delivery. Return back your dealer. Credit will be given and we pay postage or until \$2.00 and per postman delivery plus C.O.D. charges and fee.

DREMEL MFG. CO. Dept. 126K, Racine, Wisconsin

Now you can spray



New 3-in-one Oil-Spry lubricates and forms a barrier against rust! No more messy rags—oily fingers! Sprays oil at touch of button!



"3-IN-ONE" OIL

Money-Making Tools!

It's easy to own the same "pay-off" tools used and endorsed by America's top-earning mechanicals! You can start building your own kit with basic Snap-on tools—add others any time. Never sold in stores—direct to users only. Send today for free catalog!

Snap-on Tools Corporation
3000-J, 25th Ave., Kenosha, Wis.

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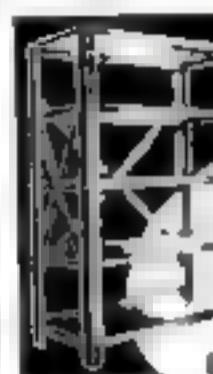
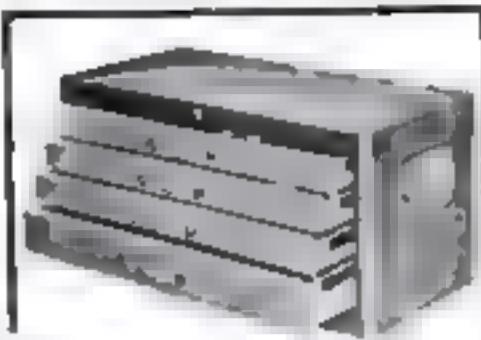


WHERE ELSE

can you get 4 drawers with built-in-locking system, sliding on compound guides—at this price? Baked blue-gray enamel. 26" x 12" x 12". Your money back if not satisfied! Write for bulletin, describing other and 12 other models.

NUOT MANUFACTURING CO.
532 No. Wheeler St., St. Paul 4, Minn.

**Heavy Duty, All Steel
TOOL CHEST
\$25.90 F.O.B.
ST. PAUL**



SAVE 50% - Sturdy Steel Shelving

Buy Direct from the Factory
Home • Office • Industry
Mobile • Will Hold 2,000 Lbs. | **TWICE** as much as wood
Strong, practical, drop-leaf portable
72" high, 36" wide, 13" deep, complete
with 4 uprights, 3 shelves,
braces, bolts ready to assemble
yourself in minutes. Money-back
guarantee. Shipping weight 50 lbs. **\$9.88**
In case, No tools 100% money-back guarantee. Shipping weight 50 lbs. \$12.00

RELIABLE Manufacturing, Box 7511, St. Paul 10, Minnesota

ONE-MAN SAWMILL LOW AS... \$50.00

Take BELSAW Portable Sawmill right to the trees—turn out valuable lumber for home and here—sell to local yards—make up to \$50 a day custom sawing for neighbors. BELSAW lasts a lifetime. As you needed. Power with tractor or auto engine. Businesses get excellent results. Send today for **FREE BOOK**

BELSAW MACHINERY CO.
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ONE Power TOOL for DOZENS of JOBS!



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FOREDOM FLEXIBLE SHAFT MACHINES

SAVE MONEY ...
provide finishing for wood
since 1922. Penetrates, penetrates
oil, varnish, paint, shellac, lacquer,
stain, resin, varnish, lacquer, etc. Model F50.0 \$25.50
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Print Your Own



Cards, Stationery, Advertising, Circulars,
labels, photo and movie titles, check work,
etc. etc. Save money. Sold direct from
factory only. Raised printing like engraving, too.

Own a Printing Business

Print for others. Good profit. Have home shop.
Junior press \$15. Senior \$25 up. We supply everything.
Easy rules. Pays for self in short time.
Write for free catalog of outfit and all details.

KELSEY PRESSES, C-32, Merton, Conn.



10" TILT/ARBOR SAW BUILD-IT-YOURSELF from GIL-BILT KITS-PLANS

Sturdy wood steel, and aluminum construction.
NEW DELTA-TITE ball bearings. Quality and
performance of floor saws selling for \$150 to
and up. Plans, all metal parts in kit. Width 10".
Comb. blade \$25.00, fine blade \$22.00.
T.O.B. "Low" Detail PLANS-PATTERNS
only \$1.00 postpaid.

Build-it-yourself 12" and 18" Bandsaws, 6"
Belt Sander, Shaper. Simplified plans. build
easily with hand tools only. Advertised and
sold for 8 years, over 30,000 units in use.
Money back guaranteed. **FREE CATALOG**.

GILLION POWER TOOLS Dept. 70-K, Lambert Field,
St. Louis 21, Mo.

AMAZING NEW DESIGN
40 to 450 POWER
MICROSCOPE

NEWLY DEVELOPED Self-Contained
SUB-STAGE LIGHT eliminates need for
EXTERNAL LIGHT SOURCE . . .

Take advantage of our tremendous savings purchase
Microscope for use by the Amateur Scientist, Student in
Home Laboratory for study of insects, plants, minerals,
insects, liquids, etc. ORDER TODAY!

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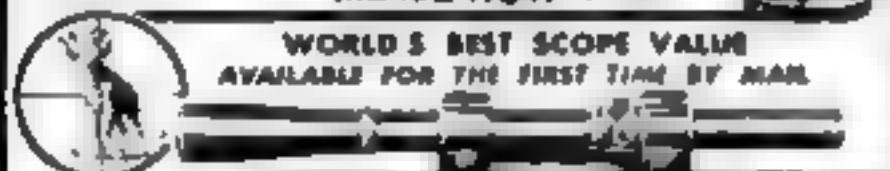
- 1-Triple, revolving front with 0X, 20X, 30X precision ground and polished lenses.
- 2-Interchangeable 6X and 15X eyepieces with precision ground and polished lenses.
- 3-5X Magnifications for all types of work - 40, 120, 150, 180, 300 and 450 Power magnification.
- 4-NEXT Sub-stage with Self-Contained Light. No external light source needed.
- 5-Large sub-stage mirror for use with optional light source.
- 6-All-metal body - built to last.
- 7-Hardwood Case and 3 slides.



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MICROSCOPE NOW

Perfect GIFT for STUDENT - AMATEUR SCIENTIST
A triple revolving, objective lens microscope of three magnification of 100, 200 or 300 POWER magnification. Has fine, ground and polished lenses and ALL METAL construction. This microscope is NOT A TOY! Right or left hand反转. Body parts made smooth, just the adjustments. Only

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100 - Field of view 10 ft.

45 - Overall 10.95

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some makers. It involves few moving parts, and permits the motor to be located way off to one side. Simple belt drives, however, may be awkward to house and less convenient when changing the speeds. To meet these problems, the Fairchild belt drive includes a three-idler turret to change speeds.

Idler drive to the rim of the turntable is most widely used. It permits a compact machine with convenient controls. But it requires a precision motor and drive train to keep noise down. Rek-o-Cut, for example, completely disassembles and reworks the motors it uses. Since an eccentric pulley or idler will cause flutter, the motor pulleys and idlers are ground to final size after they are installed on their shafts or bearings.

All turntables have some acoustic filters—cushioning to isolate vibration—but the Scott 710 uses the most elaborate. Its three-section drive shaft has soft rubber balls between sections.

Speed control. The way a turntable

shifts from 33½ to 45 to 78 r.p.m. is important only as a personal convenience. If the women in your household are very womanish about machinery, they might be baffled by a belt that has to be moved manually from one pulley to another.

If you are fussy about exact pitch—

One disadvantage of being a man is that you can't dress formally in a low-neck dress shirt.

—THE SIDEWALK SUPERINTENDENT

perhaps because you want to play an instrument to record accompaniment—some turntables have vernier speed control.

Main bearing. Turntables are like cars. How long they'll run smoothly and silently depends greatly on the main shaft bearing. The chart lists two clues to a bearing's durability: bearing composition, and its surface area (specified as diameter and length).—E. D. Fales Jr.

NEXT MONTH . . .

Better Blades for the Circular Saw

GLASS-SMOOTH cuts, no chatter, no feathering, longer intervals between sharpenings, thin-slice cuts (see photo)—these are advantages of high-quality blades you now can buy for the circular saw. Such special blades do cost more than the compromise, combination blade that usually comes with a saw, but you can do better work faster. Read about these modern blades in PS next month.



This One.



H21N-W80-87P5

SAVE \$36.30 ON THIS PESCO
HYDRAULIC CONTROL VALVE

ITEM #371V

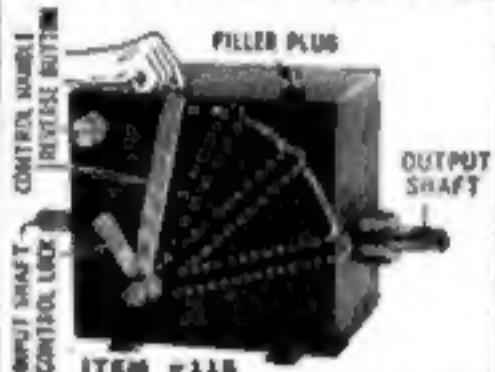


FOR SAFE
POSITIVE
CONTROL
OF HY-
DRAULIC
CYL-
INDERS
AND
MOTORS

IN RELIEF
VALVE • 4-WAY VALVE—to operate one double acting cylinder • OPEN CENTER—with valve in neutral, cylinder is locked in position and pump is unloaded. • SPRING RETURN TO NEUTRAL • FULLY BALANCED PLUNGER • EASILY STACKED INTO 2, 3, or 4 valve combinations for multiple cylinder operation. • 8 gal. per min. capacity at 1500 P.S.I.—pipe ports • CONNECT PUSH RODS TO HANDLE FOR REMOTE CONTROL • EASY MOUNTING. • LIST PRICE—\$46.00. • YOU SAVE \$30.00. • DIMENSIONS—Width 4" x 2 1/2"—Ship. Wt. 8 lbs. F.O.B. Chicago. .

16.50

**GROBAN HYDRAULIC
SPEED REDUCER
with FINGERTIP CONTROL**



FILLER PLUG

OUTPUT
SHAFT

ITEM #118

FOR: • Hoist Drives • Midget Cars • Feed Mills • Canning Machines • Conveyors • Lathes • Milling Machines • Motor Boats • Cream Separators • Garden Tractors • Pumps.

Variable output speeds from 0 to input speed available by moving control handle. Locking handle maintains setting. Use input power of 1/2 to 1 1/2 H.P. Shafts 3/8" diam. Input rotation counter-clockwise. Failing shaft. Input speed 750 R.P.M. 7 1/2" x 7 1/2" x 11 1/2". Output rotation reversible. Ship. wt. 31 lbs. Complete with 2 qt. of oil and full instructions. F.O.B. Chicago. .

54.50

MULTI-PURPOSE

**HYDRAULIC PUMP
OR MOTOR**

ITEM #269

silent, high efficiency. Helical gear type ball bearing. Hydraulic Pump or Motor. Rated 2 Gal. Per Min. At 1500 R.P.M. Delivers 1000 P.S.I. Using 6 H.P.—Never Under Rotation—3/8" Fine Thread Inlet and Outlet Ports. 1/4" Drain Port—3/8" shaft with keyway and flat for either direct or pulley drive. Dimensions—3 3/8" high, 7 1/4" long, 5 1/8" wide. Shipping weight 16 lbs. F.O.B. Chicago. .

45.50

**BRAND NEW 1 H.P.
12 Volt Electric Motor**



ITEM #2308

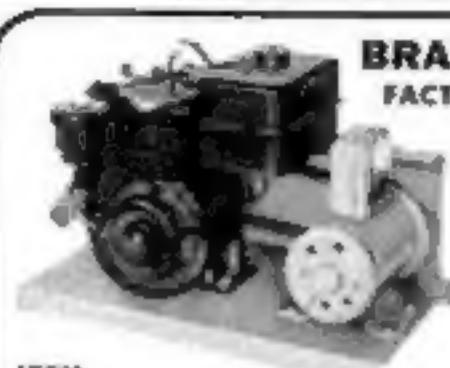
Rated 1 H.P.—100 watts, 12 volts, D.C.—This double shaft motor of ball-bearing construction may be run on 4 volts for lower horsepower requirements. Standard 3/8" shafts. Bronze bearings. Dimensions—Diameter 7" x 11 1/2", 29 in. wt. 19 lbs. A real **12.50** F.O.B. Chicago. .

2-H.P.—24 Volts—80 Amps
ELECTRIC MOTOR 4000 RPM

Spline shaft both ends. Style similar to above. Mfgd. by Hobart or Ingle. ITEM #315 F.O.B. Chicago. .

13.00

GROBAN BARGAINS!
SURPLUS & NEWLY MANUFACTURED
SPECIALS



ITEM #2008-B

Dimensions:
Length 20 1/2"
Width 12"
Height 16"

Compact—Fits in the Trunk of Your Car

FULL 1000 WATTS A.C. 60 cycles, 8 amper. Powered by Husky Briggs-Stratton engine with recoil starter. Engine and generator operate at 3600 R.P.M. for maximum efficiency at minimum weight. Both units are mounted on steel base, with heavy sheet metal bell guard. Generator is self-regulating, and is equipped with outlet box containing fuse and 2 A.C. convenience receptacles. Cost only 5¢ an hour to operate. Shipping wt. 100 lbs. (Regular price \$225). You save \$65.50. Now only, F.O.B. Chicago. .

159.50

200 WATT—GENERATOR SET—same as above, slightly smaller—with Briggs-Stratton Engine—**129.50**
Model 708—F.O.B. Chicago.

ITEM #2008 2000 WATTS A.C. 60 cycles, 8 amper. Powered by Husky, fast starting Briggs-Stratton engine. Mounted on portable steel carrying base for easy handling. Just right for small cottage and cabin needing inexpensive 2000 Watts of electricity. ship. Wt. 190 lbs. F.O.B. Chicago. .

295.00

**DOUBLE ACTION
HYDRAULIC CYLINDERS**



ITEM #310—1 1/2" bore, 1 1/2" stroke. Alloy steel cylinder wall. Micro-Honed and all steel 1 1/2" diameter piston rod. 19 1/2" overall length closed. Clevis mounting at base and shaft. Will lift 2025 lbs. with 1000 P.S.I. Pump Pressure. Use 3/8" tubing fittings. (Fittings to pipe thread: two 3/8" M.P.T or 3/8" F.F.T.) A \$10.00 value. Shipping weight 11 lbs. F.O.B. Chicago. .

25.00

ITEM #314-C—1 1/2" bore, 28" stroke. Will lift 1760 lbs. with 1000 lbs. pump pressure. Great for hay loaders, etc. 1" stainless steel piston rod. Postpaid. .

16.95

ITEM #330C—1 1/2" bore, 4 1/2" stroke, alloy steel barrel, aluminum alloy ends, clevis mounting at both ends. Lifting capacity 1760 lbs. in approximately 1/2 second using 1000 P.S.I., overall length closed 13 1/2", has 2 1/4" fine threaded ports. Postpaid. .

4.95

**MASTER & SLAVE
HYDRAULIC REMOTE CONTROL SET**

ITEM #412—Designed for remote operation of controls on engines, boats, special machinery, etc. Eliminates complicated mechanical linkages, cables, pulleys, etc. The master unit connects to the slave unit with a single 1/4" tube. When master control lever is moved, slave lever follows exactly. Light, compact, aluminum alloy construction. Dim. of both units: 5 1/2" W. 9" H. 1 1/2" D. (Exclusive of handle) Ship. Wt. 8 lbs. F.O.B. Chicago. .

27.50 per pair
(Not including handle and tubing)

HIGGINS BRONZE CENTRIFUGAL PUMP



PUMPS ALMOST ANYTHING

Fine for: • Irrigation • Pumping • Sewer Drainage

75 gallons per minute @ 2400 R.P.M.

Hydraulic Type P.N.B. Model H. marine style pump. Open impeller design for handling muddy water. Delivers 75 gallons per minute, 30 foot head with 1/2 H.P. motor. Pump body and impeller are made of solid bronze, with alloy steel 1 1/2" diameter shaft, 1 1/4" bore. Rotation of the pump is clockwise. Inlet has 1 1/2" pipe thread. Pump 1 1/2" outlet for hose connection. Shipping weight 23 lbs. F.O.B. Chicago. .

23.50

GROBAN SUPPLY CO. Dept. PE-10
1139 S. WABASH AVE., CHICAGO 5, ILL.

GENERAL ELECTRIC

"MAZDA"

5 1/2" Sealed Beam

110 V. SPOTLIGHTS

THROWS A BEAM
TO 1000 FT.

Item #418

Uses conventional 110 Volt current—Fine for lighting up driveways, signs, parking lots, displays, garages. Built for use as Flashing Signal for U.S. Navy—to stand heavy surge loads. Shipping Wt. 2 lbs. U.S. Gov't. Cost \$12.60 ea. New Each. .

2.50 Postpaid



**HYDRAULIC
PRESSURE GAUGE**

Also suitable for oil, water, air, steam.

RANGE 0-1000 P.S.I.

ITEM #408

Black cast iron case with 6" diameter rear mounting flange. Both side connections by 1/4" pipe threads. Has hand movement for greater accuracy. Shipping Wt. 8 lbs. Manufactured by H. O. Trerice Co., Detroit, Michigan. Model 41-G-450—Black numerals on white face, 20 lb. increments, within 100 lb. divisions. \$32.60 value—Postpaid. .



**1/4" METAL
STAMPING SET**

STAMP YOUR NAME
ON WOOD OR METAL



ITEM #390

Full alphabet A to Z, "A" and period. Precision hand trimmed deep cut, hardened STEEL STAMPS—in fitted Wooden Box—made to rigid U.S. Navy specifications by Young Bros.—Comparable to sets selling for \$27.00. .

5.95

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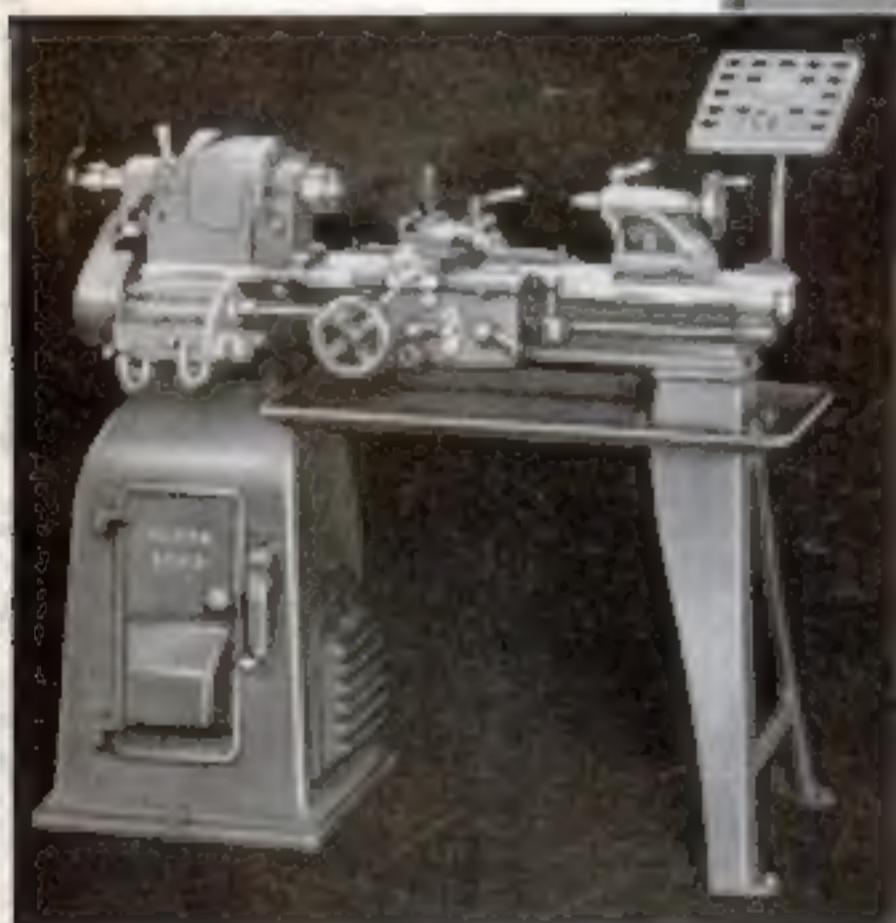
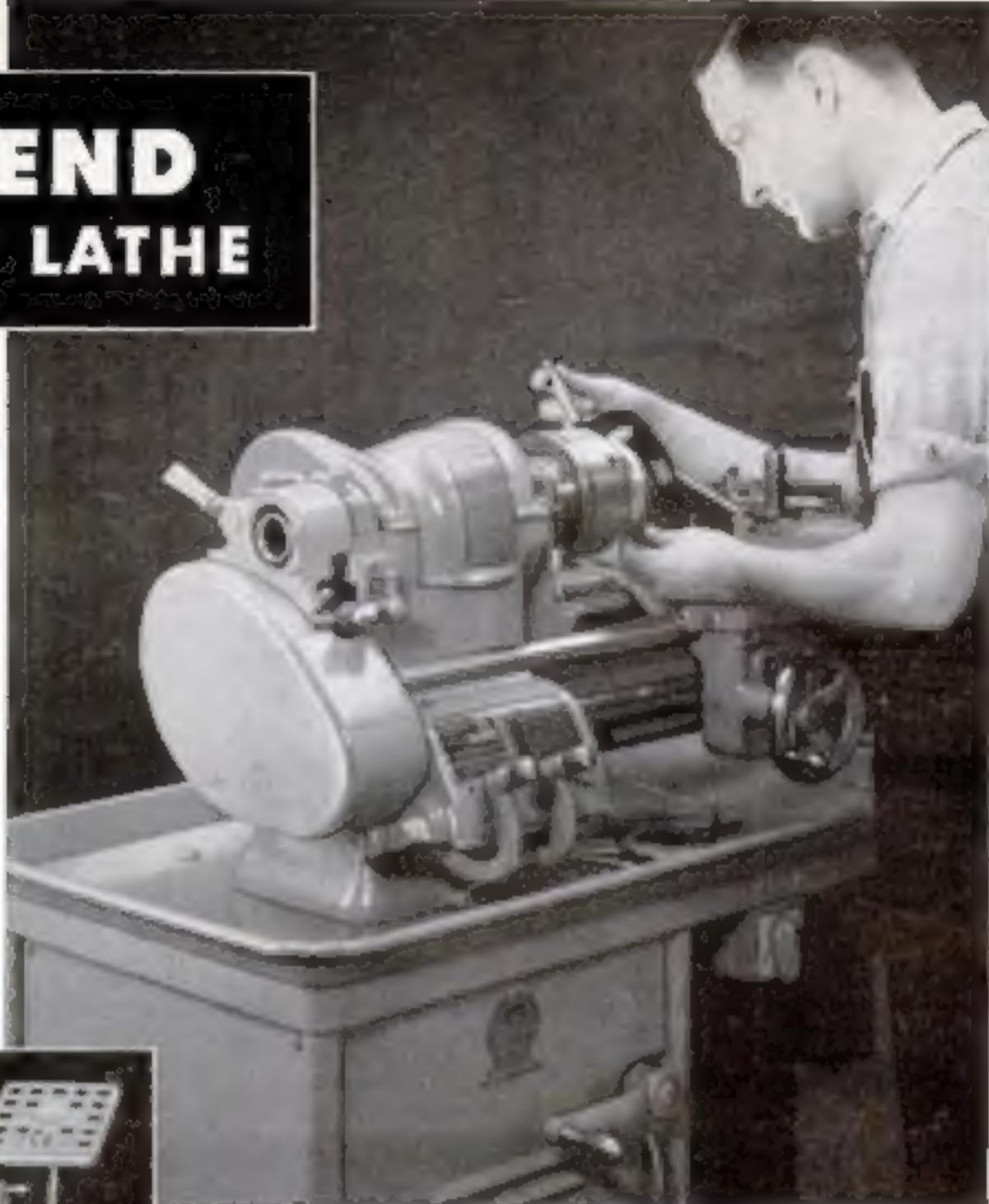
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for those
who want
the best!



Built for exacting industrial work, the South Bend 10"-1" collet lathe satisfies the demands of any craftsman. Its accuracy simplifies precision jobs and permits work of the highest professional quality. This is the perfect tool for shop owners who want accuracy and versatility. Write for literature on the 10"-1" collet lathe and its many attachments. Time payment terms available. Only 3 1/4% interest on original unpaid balance due.



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Name _____ Street _____
City _____ State _____

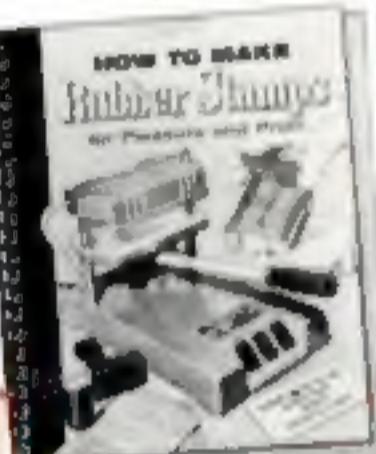
Building Better Tools Since 1906 • SOUTH BEND LATHE • South Bend 22, Indiana

New Rubber Stamp Business Pays UP \$9.20 an Hour!

Start at Home in Spare Time with this Little Table Top Machine ➤

The multi-million dollar Rubber Stamp Business—once controlled by a few big companies—is now being taken over by small home operators—one in each community throughout the U.S. Men and women who have this inexpensive machine can turn out huge quantities of Rubber Stamps with special wording that buyers once were forced to order from big cities. Material costing only 27¢ makes a stamp that sells for \$1.80. The machine that does the work is simple and easy to operate and it turns out as many as six Rubber Stamps at a time—each with different

wording such as names, addresses, notices, stock numbers, prices and other "copy" needed by offices, factories and individuals. Working full capacity, it can earn as much as \$9.20 an hour for the operator! Now you can get into this big-pay business yourself, with your own home as headquarters. You don't need any experience. We supply everything, including complete instructions and eight ways to get business coming in fast. Start making up to \$9.20 an hour from the very beginning. Cash in on the profitable Rubber Stamp Business in your community.



Here's what the **NEW**
WARNER PLAN tells you about
making money with **RUBBER STAMPS**

CHAPTERS

1. HOW TO have fun now and at the same time provide for a secure and prosperous future.
2. HOW TO check the advantages of operating a Rubber Stamp Business in your own community.
3. HOW TO acquire a general knowledge of the business based on a brief history of the Rubber Stamp.
4. HOW TO visualize the scope of the Rubber Stamp market.
5. HOW TO make a Rubber Stamp (general outline).
6. HOW TO assess the value of Warner Equipment.
7. HOW TO get acquainted with the "Tools of your Trade."
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10. HOW TO make "Special" Rubber Stamps.
11. HOW TO use printing cuts in making a Rubber Stamp.
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13. HOW TO price your complete Rubber Stamp Line.
14. HOW TO figure costs so you will be sure of a substantial profit on all the work you turn out.
15. HOW TO set up your workshop.
16. HOW TO get the most out of Warner's "Eight Tested Sources for Getting Business."
17. HOW TO operate at peak efficiency when **YOU ARE YOUR OWN BOSS**.
18. HOW TO get started on a cash outlay so small that you can get back your entire investment within a short time.

New Warner Success Plan
Tells How to Build—Step by Step—to Big Profits
and Personal Independence . . . **READ THIS PLAN FOR**
2 WEEKS—ENTIRELY AT MY RISK

In this amazing Plan you will find exact and detailed instructions for starting a Home Business in spare time—without giving up your present job and without risking the loss of a single pay check. The Warner Plan shows you—with pictures, photographs and drawings—just how to make Rubber Stamps as good as those turned out by the big companies. It shows how to get orders without canvassing or house-to-house selling. It shows you how to expand, how to get others to work for you and how to be **SURE** of at least twice the money you make on your present job for a life of personal independence.

READ PLAN BEFORE YOU DECIDE

But don't make any decision now. Read the Plan **first**—entirely at my risk. Then—after you have made a careful investigation—after you have talked things over with your family—only then do you decide what you want to do.

The thing to do now is to get full details which I will send you **FREE**. No salesman will call to urge you to buy anything. Mail attached postcard today—**NO POSTAGE REQUIRED**. I will see that complete information goes out to you by return mail—postage paid.

Mason R. Warner, RUBBER STAMP DIVISION
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TALK ABOUT PERFORMANCE... they're *loaded!* Three superb new "35's." A new Lark magnificently styled to complement the finest boats afloat. New, more powerful, high compression engines

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A Division of Outboard Marine Corporation
In Canada: Mfg. by Evinrude Motors, Peterborough



Evinrude
quiet outboard motors